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REMOTE STORAGE

THE ELECTRICAL RECORD

VOLUME XVII

January - June, 1915

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Impetus has been given to the manufacture and sale of dry batteries by the war in Europe, agents of the nations now at odds having come here with orders for large quantities of electric flashlights and hand lanterns, both of which depend on these batteries for service. The increasing demand for these flashlights and hand lanterns at home and abroad has more than filled the gap in the call for dry batteries caused by the development of the low voltage transformer. In justice to this unassuming little energizer it must be said that it is too useful, too handy, and too economical a device ever to have its market impaired by any apparatus of like purpose that relies on central station current for service. Central station service is as a rule limited by the radius of its power circuit. There is no limit to the zone of service of the dry battery, it goes with man to the ends of the earth.

In recent years there have appeared many kinds of shop and home devices that operate on electrical pressures somewhat lower than the standard lighting pressure of 110 volts. Among the devices that operate on these lower pressures are small motor operated mechanical toys, electric advertising signs, and the signaling systems that consist of groups of bells, buzzers, annunciators, door-openers, and semaphores. The demand for an apparatus to supply these lower pressures brought about the development of the low-voltage transformer which is now being marketed in many different types. For the benefit of our readers who wish to inform themselves on the attributes of these low-voltage transformers—primary and secondary voltages, loads they will carry, dimensions, and weights—we publish elsewhere in this issue complete data in tabular form. The text matter will be found to contain a brief summary of the essentials governing their design and operation.

Eight years ago the ELECTRICAL RECORD came into being in response to a demand from the trade for a paper that would confine itself to news of electrical goods and those who make and sell them. Believing that modesty oft allures where bluster repels, we desist from making comment on the measure of our success in meeting this demand. We prefer to leave that to our readers, who have increased from a scant hundred or so during our first year, to many thousands on this, the beginning of our ninth. By way of celebrating our ninth anniversary, we come before our readers in a new and more attractive dress—new cover, new type, new reading matter, and new arrangement of classified index and advertisements. Though our form is changed, our policy remains the same as before. We shall spare no effort to make each issue better than the preceding one. We shall continue to print accurately and briefly all the news the trade is interested in, so the busy man can read, and understand, as he runs. We shall continue to put news on every page, and not fill up valuable space with prolix utterances on subjects that properly belong in the musty tomes of the erudite societies.

The year just closed has produced its quota of new developments in the electrical field, all of which have been noted from time to time in brief form in this journal. We need not repeat these developments at length here, but for the benefit of our readers who would like a brief summary we recall that in the lighting field there appeared the nitrogen-filled tungsten lamp giving one candle power on one-half watt consumption. In the field that deals with heating, or resistance to passage of current, a Dutch physicist found that at extremely low temperatures the resistance of such metals as mercury, lead, and tin almost vanished. In the power field the split phase motor—a motor operated on single phase and wound so that polyphase current can be supplied from it directly to traction motors—made its appearance and is now in use on a southern freight railway system. Wireless telegraphy profited greatly by the development of the "reflection alternator" which generates at the hitherto unheard of frequency of forty thousand cycles

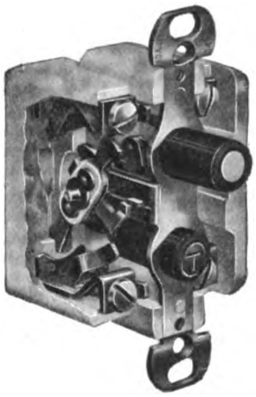
All four divisions of the industry—manufacturers, jobbers and dealers, contractors, and central station operators—will find it to their interest to read what we have to say elsewhere in this issue about a hurriedly called meeting held in New York late last month to discuss a proposed radical change in house wiring. From the scant information at hand it appears that this change, if it become effective, will revolutionize present house wiring methods. It involves the use of only one wire, the return being through the metallic conduit surrounding it. Such a system, it is said, is in general use abroad. The claim is made by those who have studied it that it is just as safe as the two-wire method in use here, and that it can be installed for less than half the price now charged for two-wire work. If the claims made for the one-wire system are well founded, we advise all contractors to keep in touch with the work of the investigating committee appointed at the last meeting.

NEW PRODUCTS

THIS DEPARTMENT IS DEVOTED EXCLUSIVELY TO NEW GOODS, AND IS A COMPLETE MONTHLY RECORD OF PROGRESS

Circle T Push Switch

The Trumbull Electric Mfg. Co., Plainville, Conn., will shortly put on the market the new "Circle T" push switch shown below. What the makers call "Life and Death Tests" have been applied to this switch while it has been in the making, and these tests, they add, prove that the long drive, controlled by a strong and carefully adjusted spring action, result in a combination of easy action and unusual release attachment.



"Circle T" push switch. Made by The Trumbull Electric Mfg. Co., Plainville, Conn.

Best Non-Separable Swivel Attachment Plug

A new swivel attachment plug that is wired without taking apart has just been brought out by the Best Electric Co., of Pittsburgh, Pa. This plug is known as the "Best" non-separable swivel attachment plug, and is designed particularly to cut down the necessary time consumed in wiring the ordinary plug.

Attachment plug. Made by Best Electric Co., 51st and Harrison streets, Pittsburgh, Pa.

This plug is made of composition—an asbestos composition that is practically indestructible. Brass screws are used throughout.

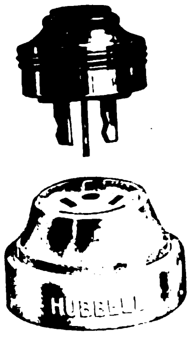
The binding posts are easily accessible. There are two leads from the cap, one for each wire direct to its binding post. The makers claim that there is no fumbling and fishing for wires, as each wire comes from the lead in position to be attached to its binding post. It is readily seen that such an arrangement will save all the time usually consumed in taking a plug apart and again putting it together in wiring.

This company also offers the trade a line of sockets, including the Best lock socket. This socket is furnished in brass, porcelain, and asbestos weatherproof composition, and with and without special key release attachment.

A feature of Best sockets, both the regular type and the lock sockets, is that every part is interchangeable. If a socket is broken it is only necessary to replace the broken part. This arrangement saves buying an entire new socket.

Hubbell Polarized Wall Receptacle

Contractors will be interested in the new fitting shown in the accompanying illustration. It has just been put on the market by Harvey Hubbell, Inc., Bridgeport, Conn. It is called a 20-ampere polarized wall receptacle for three-way work. The base is constructed of porcelain, enclosing substantial brass terminals. The cap is also of porcelain. It has a brass cover, and is finished in old brass.

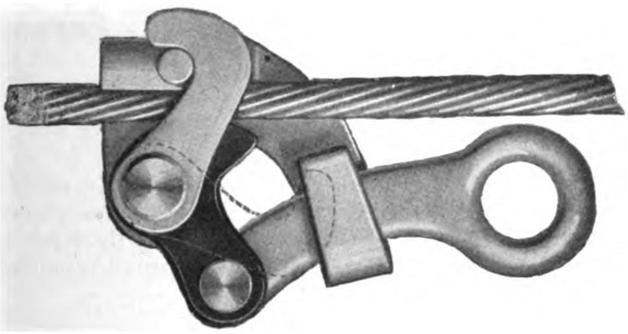


Twenty ampere polarized wall receptacle for three-wire work. Made by Harvey Hubbell, Inc., Bridgeport, Conn.

Klein Haven's Clamp

Mathias Klein & Sons, tool manufacturers, 562 West Van Buren street, Chicago, have perfected and are now marketing an improved Klein Haven's clamp adapted for handling plain or stranded wire or cables up to 3/4 inches in diameter.

The particular feature of construction is the addition of a swing latch which engages with a stud on the lower jaw, thus centralizing the pressure on the cross-bolt which is made of turned machined steel.



Klein Haven's cable clamp. Made by Mathias Klein & Sons, 562 West Van Buren street, Chicago, Ill.

The body and handle of this clamp are made of steel forging and the eccentric of hardened tool steel. This tool is the outgrowth of a demand for a clamp to accommodate larger than ½-inch cable.

Pipe Taplet Tap Block

A new tap block has been designed for Paiste pipe taplets by The Hart & Hegeman Mfg. Co., 342 Capitol avenue, Hartford, Conn. It will fit all way down in the taplet, although there is plenty of space under it for a third wire.

No. 5297 Paiste tap block. Made by The Hart & Hegeman Mfg. Co., 342 Capitol avenue, Hartford, Conn.

Making a branch in Type T Paiste pipe taplet with No. 5297 Paiste tap block

This tap block does away with all soldering, either of branch wires to the main wires, or of tap wires for fittings. The main wires are bared for ⅜ of an inch, and fastened to the binding screws of the tap block. The tap or branch wires are fastened to the connecting binding screws.

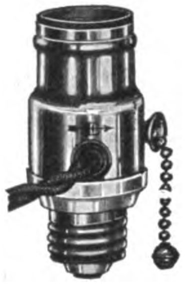
This tap block is approved, and is said to make a safe joint without any risk of short circuiting. One size fits both ½ inch and ¾ inch pipe taplets.

Electric Chair

This is not the sort of chair sometimes used in prisons for ending the careers of disturbers of society. It isn't a dangerous or even a harmful device; it is just a regular household chair equipped with a simple apparatus that makes the sitter want to stand up in a hurry. There are no wires in sight, the chair looks as commonplace and as innocent as the ordinary sitting room variety, but there is a small jolt in the seat coming to anybody that happens to sit in it. It is made by John J. Odenwald, 1204 H street, N. W., Washington, D. C., and is recommended for use in amusement parks and other places where practical jokes are taken in the right spirit.

Arrow Pull Socket Current Tap

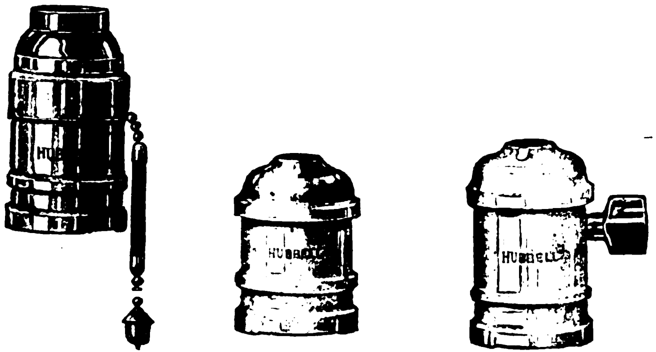
A new idea for a current tap has been originated by The Arrow Electric Co., Hartford, Conn. It consists of a pull socket with lamp base attachment and an outlet for an extension, the latter being controlled independently of the lamp in the pull socket. The device is shown in the accompanying illustration.



Pull socket current tap. Made by The Arrow Electric Co., Hartford, Conn.

Hubbell Porcelain Sockets

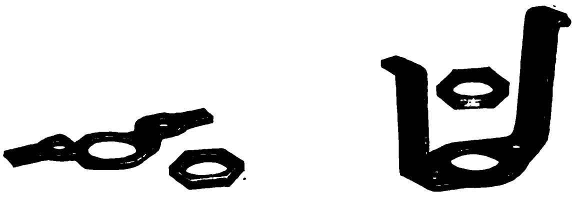
Dealers and contractors are requested to make a note to the effect that Harvey Hubbell, Inc., Bridgeport, Conn., is now offering the trade the new line of porcelain sockets represented by the annexed cuts. All three of these sockets have ½-inch aluminum caps. Both pull and key sockets have a capacity of 250 watts at a pressure of 250 volts. The keyless type has a capacity of 600 watts at 250 volts.



Pull, keyless, and key porcelain sockets with aluminum caps. Made by Harvey Hubbell, Inc., Bridgeport, Conn.

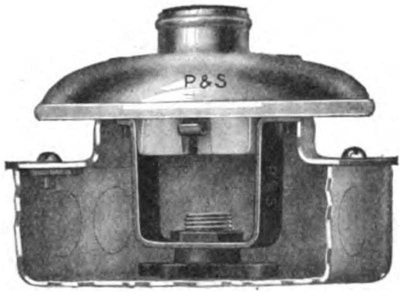
P & S Conduit Box Straps

Pass & Seymour, Inc., Solvay, N. Y., are in the market with the new conduit box strap shown in the annexed illustrations. This fitting is designed to assist the contractor in attaching certain types of receptacles to some of the modern types of outlet boxes, especially to the pancake type of box as well as the deep box used with a cover and without lugs or ears.

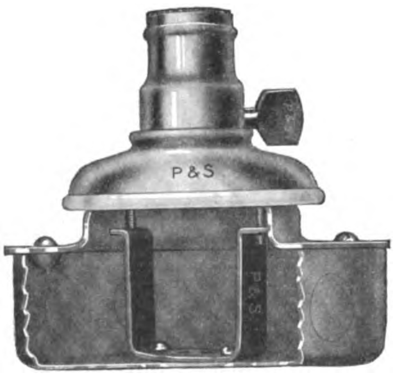


Two forms of conduit box straps. Made by Pass & Seymour, Inc., Solvay, N. Y.

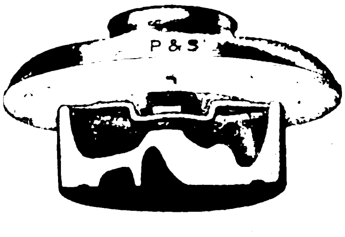
Pass & Seymour conduit box strap on pancake box with stud



Outlet box receptacle mounted on fixture stud by means of Pass & Seymour conduit box strap



Wall receptacle mounted on conduit box without stud, by means of Pass & Seymour conduit box strap

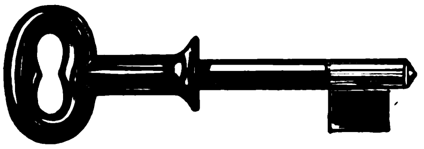


Pass & Seymour conduit box strap on BX box

Pass & Seymour now make this conduit box strap in two sizes or styles, so as to permit its use in a deep or shallow box at will. Either style may be used with or without the fixture stud.

Policeman's Safety Key

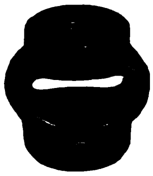
There has just been placed on the market a simple invention which aims to protect the policeman from electrical shock when sending in his duty call over police patrol boxes. The key with which he opens the patrol box is now made of a special composition that is hard as metal but has excellent insulating properties. This key has a shoulder in the center which prevents the hand from coming in contact with the metal of the box. It is made by The Gamewell Fire Alarm Telegraph Co., Newton Upper Falls, Mass.



Policeman's safety key. Made bv The Gamewell Fire Alarm Telegraph Co., Newton Upper Falls, Mass.

Pittsburgh Malleable Iron Hickey

The annexed cut shows the malleable iron hickey made by the Pittsburgh Valve & Fittings Co., of Barberton, Ohio, which has been approved by the Underwriters.



Malleable iron hickey. Made by Pittsburgh Valve & Fittings Co., Barberton, Ohio

These hickeys are tapped to Briggs standard gauge, and are, as their name implies, used in connection with electric fixtures that require firm support.

Belden Vulcanized Fibre

A new line of vulcanized fibre, rods, sheets, and tubing, has just been put on the market by the Belden Mfg. Co., 23rd street and Western avenue, Chicago. It is furnished in red, gray, and black colors. The rods vary in diameter from 3-32 of an inch to 2 inches; the sheets vary in thickness from ⅜ inch to 2 inches; the tubes vary in inside diameter from ⅛ inch to 4 inches.

It is said that the vulcanized fibre offered by this concern will not melt under any circumstances, but at very high temperatures it will char and become brittle. It will absorb ultimately about 50 per cent. of its weight of water, about 13 per cent. being absorbed in three hours and the greatest amount in twenty-four hours.

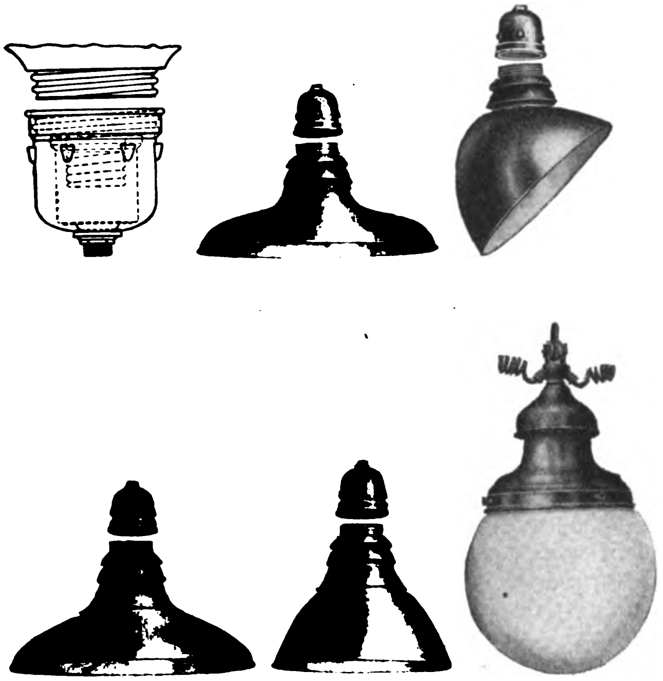
Welch Globall

"It glows in the dark," is the descriptive phrase used by the maker of this device in calling the trade's attention to it. It is designed to indicate the location of lighting fixtures when the room is dark. Attached to a fixture, as shown in the cut, it relieves one of groping or stumbling over furniture. It is made by W. C. Welch, Wakefield, Mass.

Wheeler Type "C" Fixtures

The Wheeler Reflector Co., 156 Pearl street, Boston, has recently issued literature describing some new fixtures designed especially for the new high efficiency Type C multiple mazda lamps.

Of their several types of reflector constructions, the one which is most worthy of notice is their "R" (removable), which is shown in the accompanying illustration.



Window, gallery, and showcase reflectors. Made by Wheeler Reflector Co., 156 Pearl street, Boston, Mass.

The construction consists of a porcelain enameled steel canopy which houses either a medium base or a Mogul base multiple receptacle. It is arranged at the top to take either ⅜ or ½ inch pipe and is fitted at the bottom with a soft copper thread, into which all sizes of four types of reflectors can be screwed. These four types, W (wide), D (distributing), P (parabolic or deep bowl), and N (angle) are shown with canopy R in the accompanying illustrations.

After this R canopy and socket are connected up, reflectors can be changed in the same manner as lamps, without in any way interfering with the wiring connections.

In addition to the solid copper type of fixture which is shown in the cut above, the line includes porcelain enameled steel fixtures with and without reflectors, and a wide variety of suspension fittings is also provided.

Royal Reflector and Hood

The Royal Enameling & Mfg. Co., 326 West Madison street, Chicago, is offerng the trade the new reflector and hood shown in the accompanying illustrations. This fitting is marketed in order to meet the demand for a hood that is both properly ventilated and reliably weatherproof. This hood is ventilated under both the bottom sleeve and the canopy, thus allowing currents of air to circulate freely. The sleeve and canopy are said to be so constructed that a hose can be turned on the fixture without any water getting on the inside of it. A novel feature is the construction of a hood that will allow a globe to be used in it with or without a reflector.

Bowl type reflector. Made by Royal Enameling & Mfg. Co., 326 West Madison street, Chicago, Ill.

Flat type reflector. Made by Royal Enameling & Mfg. Co., 326 West Madison street, Chicago, Ill.

Ventilated hood. Made by Royal Enameling & Mfg. Co., 326 West Madison street, Chicago, Ill.

The larger cut shows a Royal bowl type of nitrogen lamp reflector with ventilated hood attached.

Macallen Spring Fastener for Electric Fixtures

A new and improved method of installing electric fixtures by means of a hook with a strong spring attachment is exemplified in a spring fastener for electric fixtures made by The Macallen Co., Macallen and Foundry streets, Boston, Mass. This device fastens the fixture securely to the wall or ceiling without turning or sliding same, thereby eliminating all danger of marring the walls. This fixture can be installed in a small fraction of the time required by the present methods.

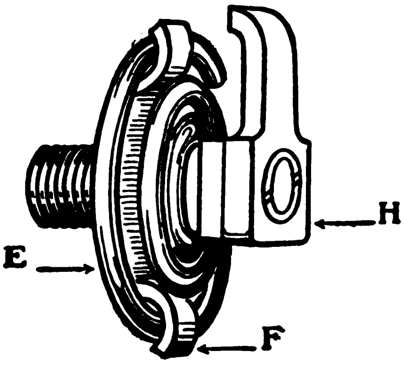


Fig. 1

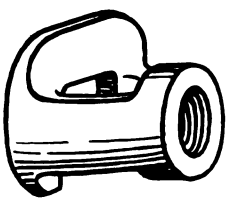


Fig. 2

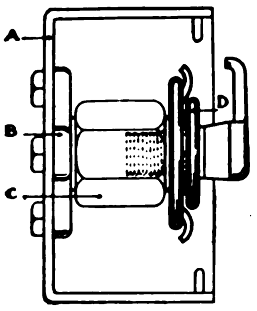


Fig. 3

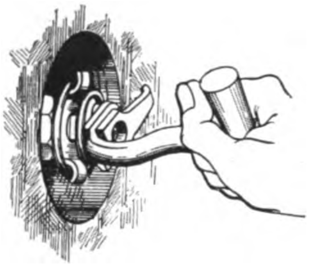


Fig. 4

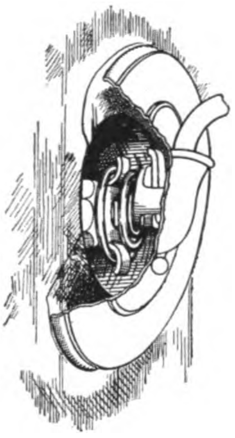


Fig. 5

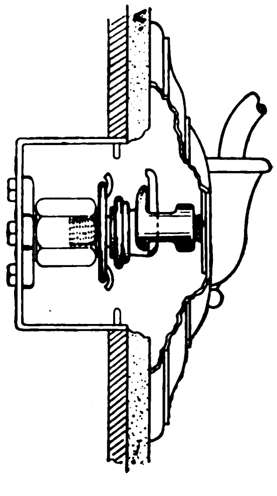


Fig. 6

Spring fastener for electric fixtures. Made by The Macallen Co., Macallen and Foundry streets, Boston, Mass.

Fig. 1 shows the fastener itself. Letter E is the spring, F the plate to which the spring is secured, and H the hook.

Fig. 2 shows the stirrup which is secured to the end of the fixture.

Fig. 3 shows the fastener screwed into the insulating joint in the junction box. Letter A is the junction box, B the stud at the bottom of the box, C the insulating joint, and D the fastener.

Fig. 4 shows the method of drawing out the hook H in Fig. 1, and turning it to one side, either right or left, where it locks itself in the forward position.

Fig. 5 shows the fixture with the stirrup, shown in Fig. 2, secured to the end of it, and placed in position on the hook H, with the canopy entirely clear of the wall.

Fig. 6 shows the fixture secured in position after it has been turned, when it automatically throws itself back into position, where it is firmly held by the tension of the spring E in Fig. 1, and locked against a turning motion.

By drawing the fixture straight forward and turning it either right or left it may be removed from the hook, if desired.

Hubbell Fixture Pull Switch and Half Reflectors

Harvey Hubbell, Inc., Bridgeport, Conn., is offering the trade two new electrical fittings. One is called a "Presturn" fixture pull switch. This switch is adapted for use with indirect lighting fixtures. It has an ornamental lock bushing, and is equipped with 10 feet of lighting cord and adjustable acorn. The standard finishes for this fitting are polished brass, old brass, and brush brass. Brush brass is furnished where no other finish is specified.

The half reflector has been brought out to meet the demand for a half reflector to accompany tungsten lamps of low wattage. It is more particularly applicable to lamps consuming 10 or 15 watts. It is made of tin or brass. Each reflector is furnished with the standard Hubbell shade center with contractile brass ring.

Suburban Small Lighting Plant

The Suburban Lighting & Gas Engine Co., of Toledo, Ohio, is offering the trade a new line of isolated lighting plants for use in homes, shops, and on farms located beyond the zone of central station service. The plant consists of a gasoline engine, generator, storage battery, and switchboard. Two classes of these plants comprise the line at present. The first class, a 30-volt system, is made in four types, any one of which can be operated by a 2-h.p. gasoline engine. The second class is also made in four types, all operating at 110 volts.

Weber Electrolier Sockets

Henry D. Seers, 131 State street, Boston, Mass., is marketing the new line of electrolier sockets with interchangeable shells now being manufactured for him by the Weber Electric Co., Schenectady, N. Y. The two parts of the shell are held together by projections contacting with a metal lining inside the cap. Rotation of the two parts is prevented by four projections on the shell contacting with openings in the lining placed inside the cap.

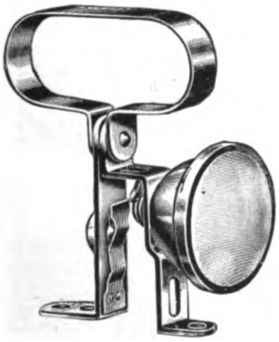
Handy-Andy Electric Lantern Attachment

Among the new electric hand lanterns that have recently come on the market we find the Handy-Andy attachment now being offered to the trade by Handy Andy Elec. Co., 9 South Clinton street, Chicago, Ill. As shown in the accompanying cut, this attachment can be easily and quickly fastened to any make of dry battery, regardless of whether it has a flush top or a projecting carbon. The lamp is turned on and off by means of the simple switch shown in the cut. Used intermittently, as such lamps are, an ordinary dry battery will furnish sufficient energy to light the lamp for at least 6 months. Lamps of this nature are being widely used, and no automobile, no matter how expensive, is fully equipped unless it carries one.

Handy-Andy electric lantern attachment. Made by Handy-Andy Electric Co., 9 South Clinton street, Chicago, Ill.

Redsealite

Another form of portable electric lantern that can be attached to any form of dry battery is that known as the "Redsealite" now being offered to the trade by the Manhattan Electrical Supply Co., 17 Park place, New York. As shown in the accompanying cut, this lamp can be attached to the battery simply by the turning of two thumb screws. The current is turned on and off by means of a simple push switch forming part of the standard which is ordinarily attached to the carbon element. The makers say that every householder and motor car operator should have a lantern of this kind close at hand to use for ordinary purposes, also for immediate use in case of emergency.

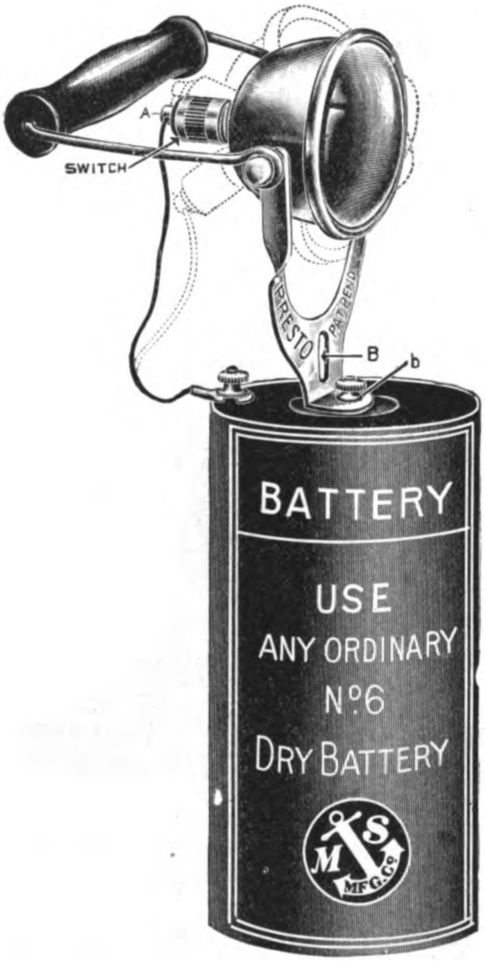


"Redsealite." Made by Manhattan Electrical Supply Co., 17 Park place, New York

"Redsealite" attached to dry battery

Presto Electric Hand Lamp

Another one of the several new electric hand lamps which have recently come on the market is shown in the accompanying cut. This one is made by the Metal Spe-



Presto electric hand lamp. Made by Metal Specialties Mfg. Co., Inc., 738 West Monroe street, Chicago, Ill.

cialties Mfg. Co., Inc., 738 West Monroe street, Chicago. As shown, the lamp can be attached to any form of No. 6 dry battery. When the battery is worked out, a new one can be got for a trifling amount, the lamp attached to it, and be ready for another several months of ordinary service.

Ever Ready Folding Case Flash Light

The American Ever Ready Works, 304 Hudson street, New York, is in the market with a novelty in the form of the folding case nickel vest pocket tungsten flash light shown in the accompanying cut. Instead of having a hinged bottom or a removable top, this holder opens like the ordinary cigarette case. A special form of battery enables the makers to furnish a thin case that will easily slip into and out of an ordinary vest pocket.

Vest pocket flash lamp. Made by American Ever Ready Works, 304 Hudson street, New York

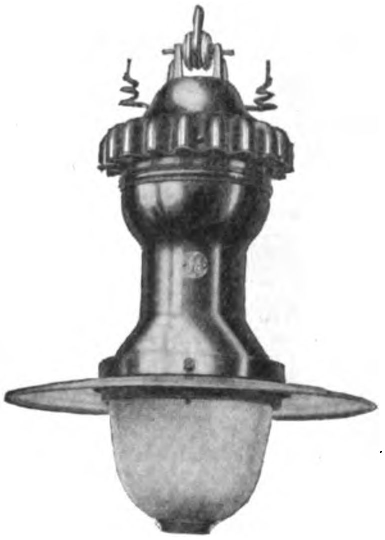
Mazda Lamp Fixtures for Street Lighting Service

The introduction of high candle-power mazda lamps and the new conditions under which they operate required the design of an entire new line of fixtures to accommodate them properly. Such a line has just been put on the market by the General Electric Co., Schenectady, N. Y. These fixtures may be divided into three different classes, namely: bracket type, pendant type, and ornamental type.

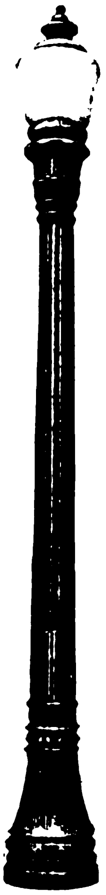
Form 1 Novalux pendant street lighting unit. Made by General Electric Co., Schenectady, N. Y.

The bracket and center span suspension fixtures, which are almost universally known, have been redesigned to accommodate the following reflecting equipment: radial wave reflector, concentric reflector or concentric reflector with prismatic refractor.

The pendant units have been designed in two different classes, known as Form 1 and Form 2. The Form 1 unit has been designed to resemble the arc lamp in general contour and appearance. It has a very substantial construction throughout. These units can be furnished with an opal diffusing globe, an opal diffusing



Form 2 Novalux pendant street lighting unit. Made by General Electric Co., Schenectady, N. Y.

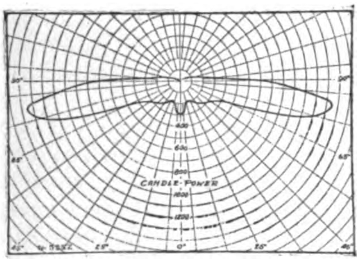


Novalux ornamental street lighting unit. Made by General Electric Co., Schenectady, N. Y.

globe and concentric reflector, a prismatic refractor and clear globe or a prismatic refractor.

The Form 2 pendant units are unique in appearance and cost less than the Form 1. They are arranged to use a diffusing globe, concentric reflector and diffusing globe, radial wave reflector or a concentric reflector and prismatic refractor. Both the Form 1 and Form 2 units are arranged to take a compensator, which is mounted under the dome and inside of the casing.

The ornamental Novalux unit has been designed to fill the demand for a highly ornamental unit where "white way" lighting is desired; and two different styles of ornamental units, known as the Forms 4 and 5, have been standardized.



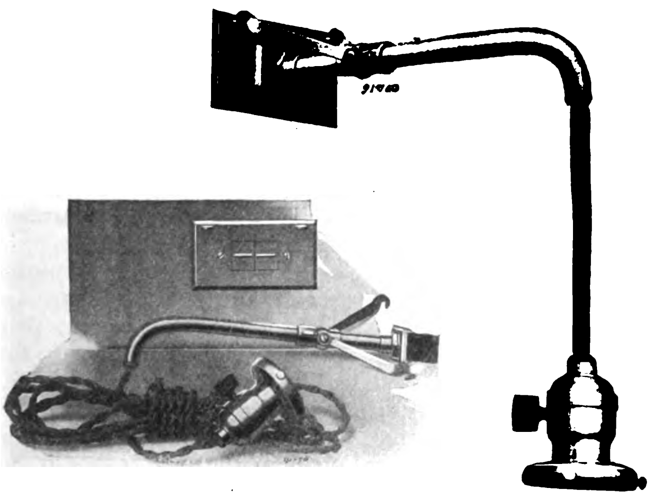
Characteristic distribution curve of 600-c.p. mazda series lamp unit equipped with concentric reflector and prismatic refractor

The refractor used in these lamps consists of two sections, one fitting inside the other. The inner section is girdled by a succession of horizontal prisms, which converge the light rays into the most useful zone; while the outer globe is lined with a series of vertical prisms, which serve to diffuse the light. The inner surface of the interior section and the outer surface of the exterior section are smooth; therefore, both sections when placed together and the top cemented present smooth outside surfaces, which facilitates cleaning, as they do not readily gather dirt and dust.

All fixtures described are suitable for all standard commercial circuits, both series and multiple.

Bryant Hotel Sample Room Lighting Bracket

This device is the result of a demand on the part of hotel managements for especially effective lighting arrangements in such of their rooms as may be used for the display of samples, and at the same time the ability to remove all evidence of the appliances which bring such rooms under the category of "sample rooms."



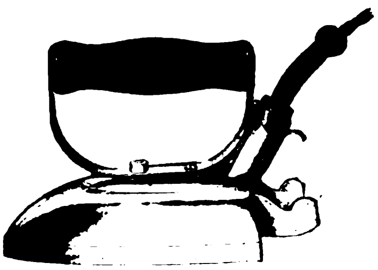
Outfit used in lighting a hotel sample room. Made by Bryant Electric Co., Bridgeport, Conn.

Around the room, at the height of the picture moulding, are located receptacles of the Bryant disappearing door type equipped with special eyelets to receive the hooks of the bracket. Each receptacle accommodates one bracket. Each bracket with its droplight can be removed at will, and the receptacles can be entirely covered up if desired by a hinged section of a picture moulding.

A single disappearing door receptacle equipped with special eyelets located over the head of a bed provides for a bed reading light, with the added advantage that it may be removed whenever the service required of the room makes it desirable. The bracket is shown in the accompanying cut. It is made by the Bryant Electric Co., Bridgeport, Conn.

Pelouze Ideal Iron

A new sad iron, furnished with a quick-break switch plug is now being offered to the trade by the Pelouze Mfg. Co., 232 East Ohio street, Chicago. No stand is furnished with this iron; it is rested simply by tilting it on the heel end. It has an ebonized handle, and comes supplied with a cord and attachment plug. It has a capacity of 500-watts and is furnished in either satin or bright nickel finish.



Ideal iron. Made by Pelouze Mfg. Co., 232 East Ohio street, Chicago, Ill.

Sun Ray Electric Heating Pad

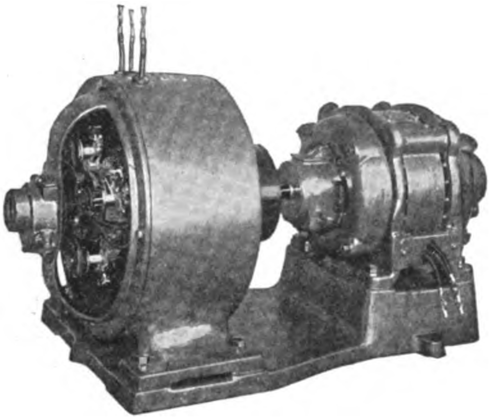
This household heating device is made by the P. & B. Mfg. Co., Milwaukee, Wis. There are two types of it, the single-heat pad, and the three-heat pad. Both types are provided with thermostats to prevent overheating. They act automatically. The single-heat pad is regulated with a single-heat switch. The three-heat pad furnishes three degrees of heat—low, medium, and high—all regulated by a special three-heat switch.

The cost of using a Sun-Ray heating pad is trifling. At the average cost of current in most cities one of these pads can be used one-half hour each day for eight days at a total cost of only one cent for the eight days. In other words, a pad can be used continuously for four hours at a cost of only one cent. The actual consumption is 18, 36, and 54 watts per hour on each of the three heats, respectively.

The Sun-Ray pad is 12 by 16 inches in size and is covered with a soft eiderdown of heavy quality in a rich shade of brown. Each pad is complete with 10 feet of flexible cord, washable slip cover, and separable plug ready to attach to any lamp socket.

Fort Wayne AC to DC Compensarcs

The Fort Wayne AC to DC compensarc is a motor-generator set which, operating upon the alternating current supply of electrical energy commonly furnished motion picture theatres, delivers direct current of proper voltage for the operation of the motion picture projection arc. This compensarc consists of a standard alternating current induction motor, direct connected to a special direct current generator, both machines being mounted on the same base in a compact manner.


Fort Wayne a. c. to d. c. compensarc for operating motion picture machine. Made by Fort Wayne Electric Works, Fort Wayne, Ind.

The windings of the generator end of this compensarc are special, so that the machines give a peculiar volt-ampere characteristic curve such that when the current at the arc reduces, the voltage automatically increases in such manner that a stable arc results without using any lamp steadying resistance whatever. Moreover, the winding protects the machine from the blowing of the fuses or other damage when the projection arc carbons are left in contact. This latter feature is especially valuable to the operator in that it permits him to "fry the carbons together" when burning the crater into proper shape.

The AC to DC compensarcs are furnished for operation on single-phase, two-phase, or three-phase circuits as desired, and for the commercial voltages. The motor is connected to the line in the manner regularly employed in connecting induction motors. The generator has the necessary leads for connection of the lamp and the field controlling rheostat. Requiring no special foundation, they can usually be installed directly in the operating booth. They are economical in the use of electrical energy from the line and practically eliminate fire risk.

The compensarcs are built in different sizes, so as to be especially suited for the operation of single arcs or projection arcs used alternately, so that there is a machine particularly adapted for practically every motion picture purpose.

"Nocare" Electrical Steam Radiator

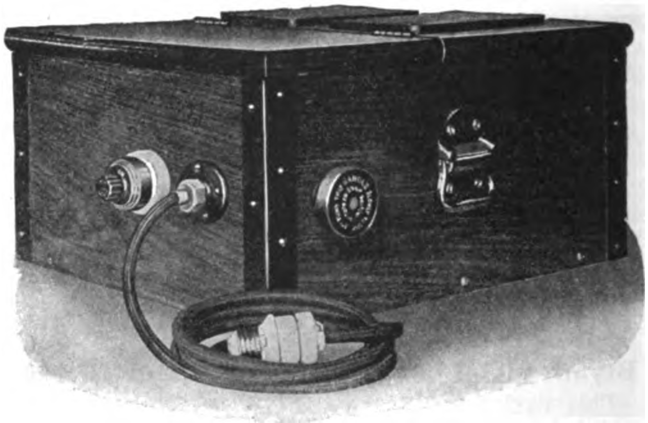
That part of the trade which caters to people who wish to live in comfort during the cold winter days will find it to their interest to look into the merits of the "Nocare" electrical steam radiator made by the Electrical Steam Radiator Co., 644 Congress street, Portland, Maine. It is made in various types, from a 15-section radiator 32 inches high taking 1000 watts, to a 10-section radiator 14 inches high taking 300 watts. The types taking from 300 to 500 watts may be safely used with ordinary lighting sockets.

A test made by a power and light company on a 15-section radiator having a radiating surface of 18 square feet and taking 1000 watts at 110 volts pressure shows that 1½ quarts of cold water were brought to the boiling point in 17 minutes. Under these conditions the temperature of a room of 2500 cubic feet capacity was raised in 1 hour and 20 minutes from 55 degrees to 64 degrees Fahrenheit.

D. & W. Direct Current Demagnetizer

To counteract the permanent magnetism imparted to iron and steel when brought in contact with a magnetic chuck, the D. & W. Fuse Co., of Providence, R. I., have devised the demagnetizer shown below. In constructing this demagnetizer the manufacturers have incorporated a rigid continuous U-shaped core made of high grade laminated electrical steel energized by two stationary coils through which alternating current is passed. The upturned core ends terminate in two accurately ground surface plates across which the pieces to be demagnetized must be passed.

The core and coils are mounted in a metal edged oak box so that the surface plates project slightly above the top of the box. A suitable switch for turning the current on and off and a well protected flexible electric cable are attached to the box as are also a pair of strong handles by which the demagnetizer can be readily carried about the shop.


Direct current demagnetizer. Made by D. & W. Fuse Co., Providence, R. I.

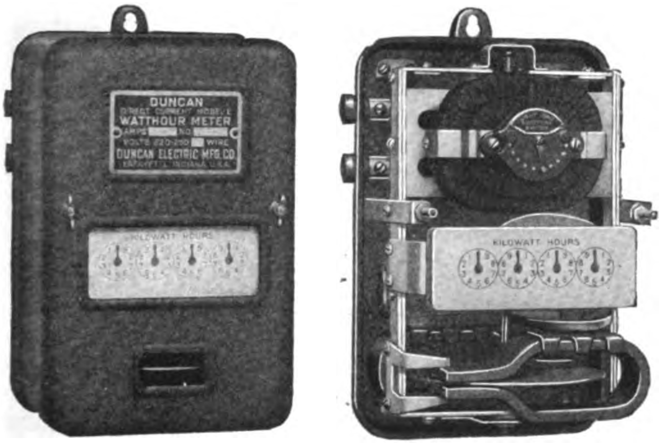
These are built in two separate types, for use on direct current. Either type can be supplied to operate on 105-125, or 210-250 volts, but not on both ranges.

The direct current demagnetizer is similar to the alternating current machine excepting that in addition it contains a small converter which changes the direct current supplied to the device to alternating current suitable for the coils on the core.

The action of both styles of demagnetizer on pieces of iron or steel, passed across the surface plates, is identical. While these pieces touch the plates, they partake of the rapidly reversing magnetism of the plates, which is caused by the alternating current encircling the core. When the pieces are slowly removed from the region of the plates, the magnetizing effect is weaker in every reversal than in the one before it, so that the pieces are finally left neutral as they pass entirely out of the field.

Model E½ Duncan Direct Current Watthour Meter

This meter has been placed on the market in response to a demand for a smaller type than that heretofore made by the Duncan Electric Manufacturing Co., of Lafayette, Ind. The parts are made interchangeable. The weight of the revolving element, comprising disk, spindle, commutator, and armature, is nearly 40 per cent. less than that of the Model E1 which this type has replaced. In consequence the load characteristic of the meter is practically a straight line.



New model E½ direct current watthour meter. Made by Duncan Electric Mfg. Co., LaFayette, Indiana

The two lower screws employed to fasten this meter to the wall are upon the inside of the meter, so, when the cover is placed in position it is impossible to tamper with these screws or put the meter out of level.

The registering train is so geared that the meter can operate on full load 24 hours per day for the entire month before the dial readings repeat. The Model E½ meter is built in 2½, 5, and 10 ampere sizes only, and for 110 and 220 volts.

Ward Leonard 15,000-Ohm Resistance Unit

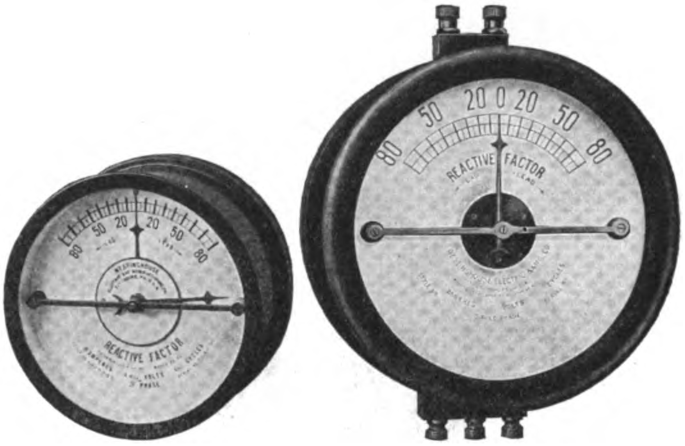
The Ward Leonard Electric Co., of Bronxville, New York, has developed a resistance unit of 15,000 ohms that is only 4 inches long and 7/16 inch in diameter. It has a capacity of 40 watts. The resistance wire has a temperature coefficient that is practically zero. The wire is in one layer and is protected against all oxidation or other depreciation such as is invariably met with where fine wires are exposed to the elements. These units can be mounted with fuse clip mountings or Edison base mountings.

Westinghouse Reactive Factor Meter

The Westinghouse reactive factor meter, which has been recently introduced, operates, like the power factor meter, on the rotating field principle. A rotating field is produced in angularly placed coils connected in shunt with the metered circuits, one for each phase of the system in the case of polyphase meters. In their field is provided a movable iron vane or armature, magnetized by a stationary coil whose current is proportional and in phase with that of the line current in one phase of the circuit. As the iron vane is attracted or repelled by the rotating field of the angularly placed coils, it takes up a position where the zero of the rotating field occurs at the same instant as zero of its own field. Thus its position indicates the phase-angle between the voltage and current of the circuit. The reactive factor meter is then calibrated to read the sine of the angle indicated while the power factor meter is calibrated to read the cosine.

In the three-phase meter the rotating field is produced by three coils spaced 60 degrees apart; in the two-phase meter by two coils spaced 90 degrees; in the single-phase meter the rotating field is produced by means of a split-phase winding connected to the voltage circuit.

The reactive factor meters, as shown, are enclosed in round dust-proof cases, the type SI being 7 inches and the type TI being 9 inches in diameter. They match in appearance the types SM and TM ammeters, voltmeters, and wattmeters.



Reactive factor meter. Made by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

These meters are made by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

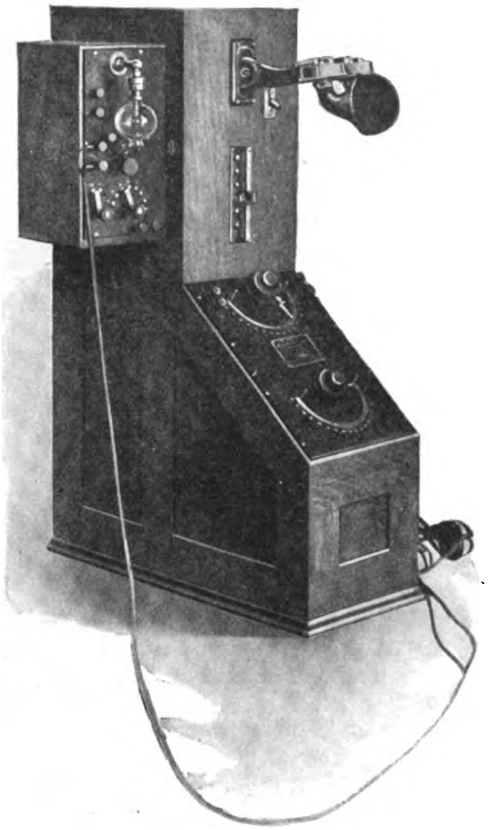
Biddle Megger

James G. Biddle, 1211-13 Arch street, Philadelphia, Pa., is offering the trade a device for testing the insulation resistance of interior wiring, cables, generator, and motors. It is shown in the accompanying cut, and is called a "Megger." This device is recommended to progressive contractors, engineers, and inspectors who wish to obtain exact results instead of the usual results following the ordinary haphazard methods of testing insulations.

New type of "megger" for testing insulation. Made by James G. Biddle, Boyertown Building, Philadelphia, Pa.

De Forest Radio Telephone Apparatus

As shown in the accompanying cut, the new type of De Forest radio telephone is markedly different from all their other types. The present type can be easily manipulated by any intelligent person after a careful reading of the instructions. The practical nature of this apparatus is attested by the recent experiment conducted on the D., L. & W. R. R. system, voice transmission being maintained from a 1-kw. transmitter at Scranton, Pa., to an express train running at full speed up to a distance of 53 miles from the transmitting station.



Radio telephone and telegraph set. Made by Radio Telephone & Telegraph Co., 101 Park avenue, New York

The transmitter apparatus resembles rather the quench spark wireless telegraph, and like that requires absolutely no further attention, after a setting to the desired wave length has once been made, than merely to press down a small switch, or "listening key," for talking, and raise same for receiving or listening. If you operate it for a minute or all day, day after day, keeping the same wave length, no changes, adjustment, or attention, other than the above, are required.

This simplicity of the new transmitter system at last permits the introduction of the De Forest radio telephone to the fields which have long awaited such a communication.

The receiving tuner is designed to be sharply selective, *i. e.,* to minimize any danger of interference method of communication.

Once the setting in degrees on the two dials for receiving a certain station is determined it is the simplest thing imaginable, to so set the pointers that the receiver is "in tune" to that particular station's wave length, and not to others.

The slide switch on front of transmitter cabinet is for tuning a given antenna (or aerial wires), to the transmitter wave length which is to be used. Ordinarily only one transmitter wave-length need ever be used at a given station, so that when the apparatus is once set for this wave length no further adjustment is needed.

The detector used is of course, the De Forest audion. This is shown mounted on a little case on the left side of the transmitter cabinet. It is connected to the receiver tuner below.

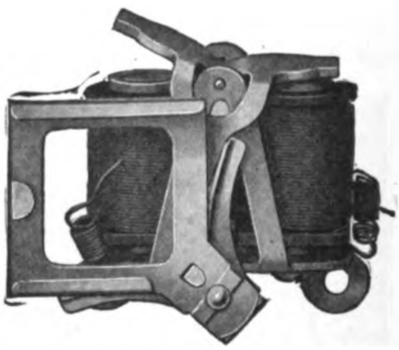
A small storage battery supplies current for lighting the audion filament, the current of which is cut off whenever the "listening key" is depressed for talking. Thus the audion acts automatically as an indicator of the condition of the set, whether switched in for talking or listening. It is useless to talk if the audion is lighted. It is impossible to receive unless the audion is lighted.

A pair of sensitive high resistance telephone receivers, together with storage battery, are supplied with each telephone set. These are to be worn when using the apparatus, talking or listening.

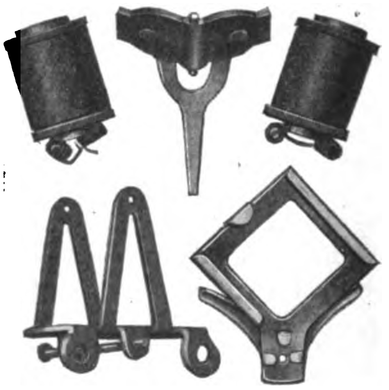
This radio telephone is made by the Radio Telephone & Telegraph Co., 101 Park avenue, New York.

Edward Lock Semaphore Drop

The Edwards lock semaphore drop combines two lock drops in one unit, and does away with the use of permanent magnets. The position locking feature of this drop is original. The rocking valve motion of the walking beam engine is employed in such manner that the work done is graduated according to the density of the magnetic field in which the armature moves. All iron parts are protected by electroplating, and magnets are wound with enameled wire.



Mechanism of semaphore annunciator. Made by Edwards & Co., 140th and Exterior streets, New York.



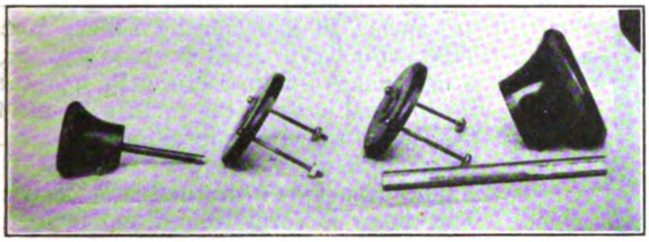
Disassembled view of semaphore annunciator. Made by Edwards & Co., 140th and Exterior streets, New York.

The drop consists of two parallel electromagnets mounted in a vertical position with an arm carrying the indicating shutter, pivoted between the two, on a line with the magnet bases, an arrangement requiring little depth, which is especially desirable in flush types. Upon energizing the right hand magnet, the shutter is thrown to the left, after which it may be returned to the first position by energizing the left magnet. The front of the annunciator is clear, as all necessary marking appears on white bristol board cards carried by the drops. The drops are all electrically reset by an ordinary push button. This makes it possible to locate the reset button away from the annunciator.

This semaphore is made by Edwards & Co., Inc., 140th and Exterior streets, New York.

Ward Leonard Hand Wheels

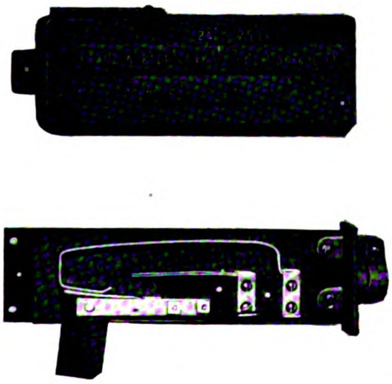
The Ward Leonard Electric Co., of Bronxville, N. Y., has developed two sizes of inexpensive hand wheels and dials for the rear of board type field rheostats. The smaller size is for its 6 in. diameter enameled rheostats, the large size for the 8, 12, and 15 in. diameter rheostats. These hand wheels and dials are finished in polished black.



Rheostat hand wheels. Made by Ward Leonard Electric Co., Bronxville, N. Y.

Safety Elevator Door Switch

Recent word from the Underwriters' Laboratories announces approval of the new safety elevator door switch now being put on the market by Franz A. Boedtcher, 413 West 41st street, New York. These switches are used in connection with the locking device of the elevator door, such as a locking bar or latch, and are so designed that the operator running the car will be forced to have the door locked before he can leave any floor. They guard against the accidents that often occur when the door leading from the elevator to the hallway is not firmly latched.

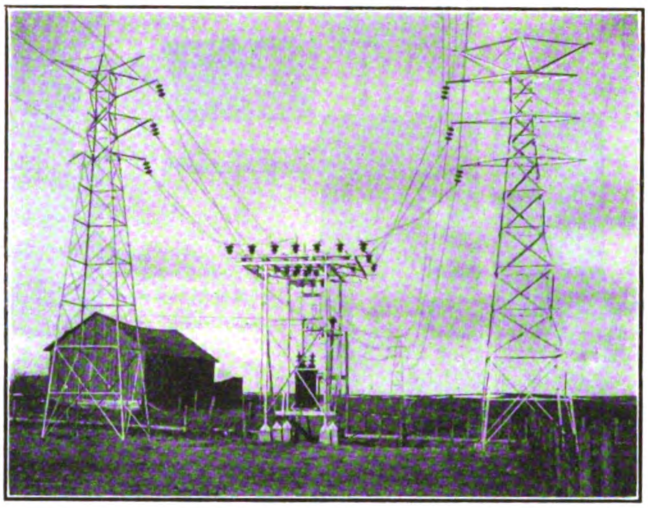


Safety switch for elevators. Made by Franz A. Boedtcher, 413 West 41st street, New York

66000-Volt Selector Type Outdoor Steel Tower Sub-station

The marked advance in the design and construction of high tension outdoor steel tower substations during the past year is well illustrated by the installation shown herewith. This station, having an initial capacity of 100 kw., and an ultimate capacity of 1000 kw., represents the latest development in low cost equipment.

In order that the three-phase transformer can be energized from either of two sources of power, a standard transmission tower was set off the right-of-way, and directly opposite a line tower—thus providing space for the double throw steel tower substation. One set of three-phase line conductors was carried to the right-hand tower, thus "splitting" the system, and offering a ready means for carrying taps to the substation without crossing of the phase wires.



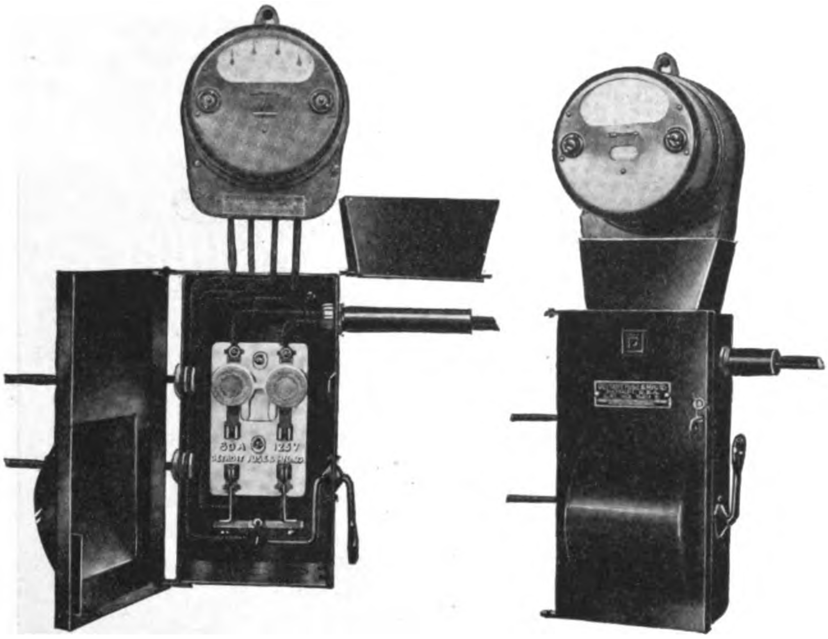
Selector type outdoor steel tower substation, 66,000 volts. Built by Delta-Star Electric Co., 617 West Jackson boulevard, Chicago, Ill.

The three-phase switches are of the interlocked selector type, permitting power to be fed from either source without danger of throwing the switch systems together. Protection is secured by means of choke coils, horn gaps and carbon-tetrachloride fuses on the high-tension side, the low-tension side being controlled by an automatic 2200-volt oil switch located in a small house at the base of the substation. This house also provides space for meters, spare parts, and distribution switches. The transformer rests on a transfer table, insuring ready means for handling units, both during installation and when the station capacity is increased.

The 2200-volt secondary leads are carried under the transformer platform into the cement house, and then pass through conduit to the overhead secondary, or town distribution. The three-phase transformer was manufactured by the Packard Electric Co., Warren, O., the entire substation with its equipment of the standard type "CAG" form, being manufactured by the Delta-Star Electric Co., 617 West Jackson boulevard, Chicago, Ill.

"Square D" Entrance Switches and Distributing Cabinets

The Detroit Fuse & Mfg. Co., 1400 Rivard street, Detroit, Mich., has added to its line the new service entrance switch and distributing cabinet, illustrated herewith. This cabinet, the makers claim, will save thousands of dollars spent annually by electric power companies in detecting and preventing tampering with circuits. A meter protecting trim can be provided so that with the meter trim in place and cover locked or sealed shut, it is impossible to tamper with the wiring for any length of time without discovery.



"Square D" entrance switches and distributing cabinets. Made by Detroit Fuse & Mfg. Co., 1400 Rivard street, Detroit, Mich.

The meter can be installed with the cabinet as a unit by a power company, and need not be removed if the current is stopped. When current supply is stopped all that needs to be done is to place the switch in the "locked off" position, and close or seal and lock the cabinet. Then the entire unit cannot be put in service until proper arrangements have been made with the central station.

It is amply provided with convenient knockouts and there is plenty of space inside the box to make the wiring easy and quick. The boxes are built of sheet steel and finished in lustrous black enamel, with switch and cutout mounted ready to install.

"Service" Gasoline Electric Set

Though especially designed and adapted for use on yachts, this isolated plant can be used for light and small power purposes in all other places where central station service is not available. It is a 3½ by 4 Rochester gas motor coupled to a 2½-kw. Rochester dynamo. The dynamo gives a pressure of 65 volts, and the gas motor is operated on 4 cycles. The outfit can be used to great advantage in moving picture shows. It is made by the Rochester Motors Co., Inc., Rochester, N. Y.

Motor Driven Peanut Roaster and Corn Popper

The Kingery Mfg. Co., Cincinnati, Ohio, is now marketing a peanut and popcorn cart de luxe, that glitters in nickel and plate glass. It is illumined with electric lamps at night, and is operated by a small Westinghouse electric motor.

Current is obtained from a plug at the vender's stand. The motor drives the peanut roaster and the rotary corn popper. Heat is obtained from gas or gasoline. These carts form a small but attractive load for central stations, as connections are easily installed and there is no meter to read, flat rates being usually charged.

Standard Internal Tool Grinder

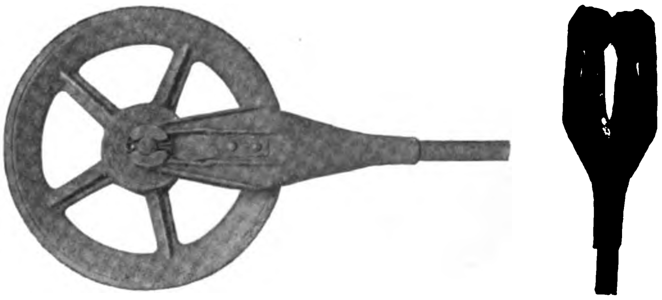
This tool is designed for grinding gasoline engine and other cylinders. It is run by a motor which operates on either alternating or direct current. The grinder is fitted with an emery wheel 3½ inches in diameter by 1 inch face. The motor has a speed of 7,000 r. p. m., which makes this tool especially adapted for internal work as the surface speed of the emery wheel is approximately 6,000 ft. per minute.

The capacity of the motor is ½ h.p. The motor is form wound and impregnated in Bakelite, which insures against all forms of motor trouble incident to high speed electrical apparatus if constructed according to slow speed motor practice. The weight of tool is 35 lb. This tool is similar in design to the many other motor driven tools brought out by this manufacturer.

It is made by the Standard Electric Tool Co., Cincinnati, Ohio.

Nuttall 10-inch Trolley Wheel

The new trolley wheel, shown below, has just been placed on the market by the E. D. Nuttall Company, Pittsburgh, Pa. This wheel has a diameter of 10 inches, a size specially adapted for high-speed service on 600-1200-volt, direct-current, or single-phase alternating-current roads. The harp is light in weight and has contact washers which do not turn. The contact spring is riveted to the outside of the harp as shown in the picture.



Ten-inch trolley wheel. Made by R. D. Nuttall Co., Pittsburgh, Pa.

Dumore Sewing Machine Motor

The Dumore sewing machine motor can be used on any make of home sewing machine, and can be attached without the use of tools. It is made by the Wisconsin Electric Co., Racine, Wis. It operates on either direct or alternating current and is so constructed that an automatic switch starts and stops the motor at the will of the operator. The motor is in operation only while the sewing machine is being used.

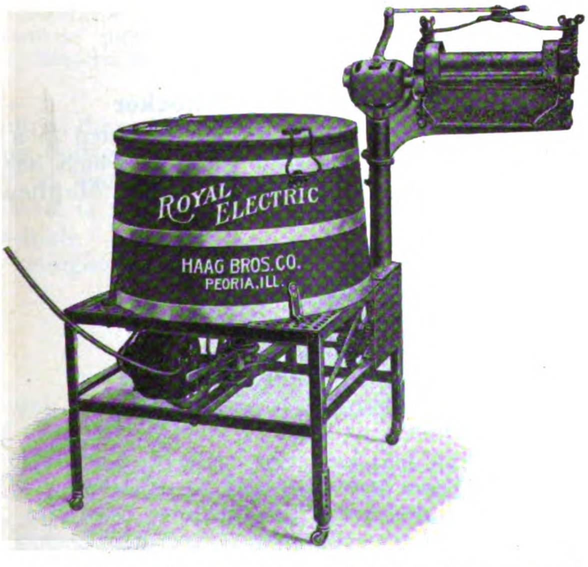
Dumore sewing machine motor. Made by Wisconsin Electric Co., Racine, Wis.

The motor is finished in black enamel, and other metal parts being oxidized. The outfit packed complete and ready for shipment weighs but 6½ lb.

The application of this motor to the sewing machine in no way interferes with the ordinary working of the sewing machine. The bobbin is filled in the regular way and the original belt is left on the machine. It takes about the same energy as a 16-candle-power incandescent lamp.

Royal Electric Washer

The Haag Brothers Co., 812 Commercial street, Peoria, Ill., is offering the trade the electric washing machine shown in the accompanying illustration. This is known as an inverted drive machine, the agitator or dolly coming up through the bottom of the tub instead of being attached to the lid. All of the operating mechanism is underneath the tub, so there is no danger of the operator's clothing catching in the gears. By means of a special device, this washer can be raised or lowered to accord with the height of the stationary tub or wash bowl. It has a revolving wringer which can be locked in any position. It is operated by a 1/6 h.p. motor.

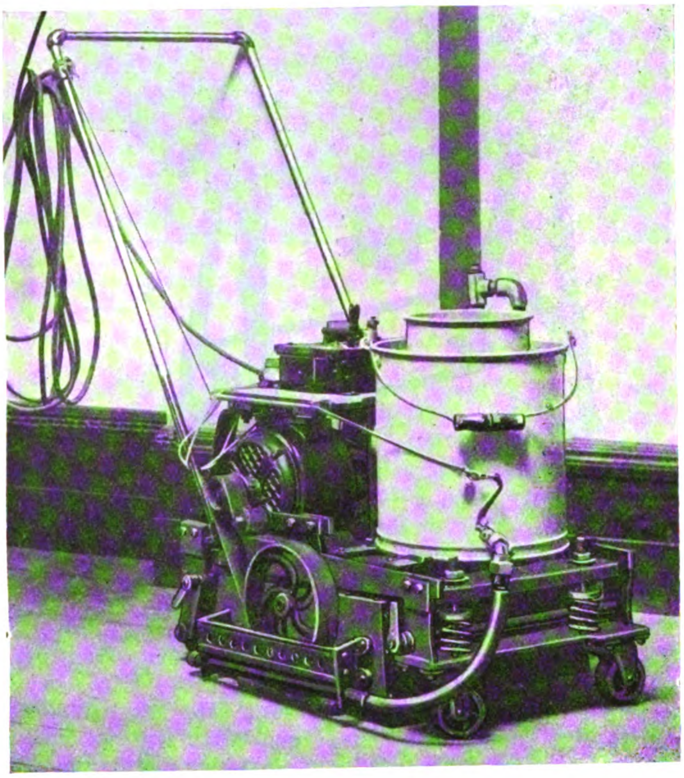


Royal electric washing machine. Made by Haag Bros. Co., Peoria, Ill.

Strickland Electric Floor Cleaner

The accompanying cut shows a new type of electric floor cleaner which has been perfected and placed on the market by E. S. Strickland, of Bound Brook, N. J.

This cleaner applies the water, scrubs the floor, and removes the dirty water in a quick and thorough manner.



Automatic electric floor cleaner. Made by E. S. Strickland, Bound Brook, N. J.

A removable water bucket having clean and dirty water compartments is located on the forward end of the machine.

Clean water is used exclusively, and is applied to the floor by a hand-operated valve while the machine is working. The dirty water is delivered by a suction pump to the dirty water compartment, of the water bucket, which is emptied after the operation.

The removal of the dirty water, by the machine saves several trips over the surface with mops, scoops, and wringers.

This cleaner is mounted on a jackframe that lifts the brushes so as to enable them to pass over doorsills or other ordinary floor elevations. The jackframe also relieves the brushes of the weight of the machine when not in use.

In operation the machine is moved back and forth in strokes of about 10 or 12 feet, and will cover over 95 per cent. of the surface of the floor. The remainder can be readily cleaned by ordinary means. As the brushes operate under a regulated pressure of weight, the machine has the advantages over a surfacing machine of working with only sufficient force to clean the floor without excessive grinding or wear to the surface. Being mounted on wheels it is readily moved about the premises. This outfit is built in three sizes at present.

Electric-Driven Silver-Burnishing Machine

This new machine consists of a wooden cylinder which is three-quarters filled with smooth, highly polished steel balls, varying in size from about ¼ inch diameter to about the size of a small pin head. In addition there are also a number of smooth, blunt slugs.

Silver burnishing machine. Operated by motor made by Robbins & Myers Co., Springfield, Ohio

Steel plates divide the cylinder into several compartments for different classes of silverware.

The machines are made in varying sizes, and are driven by ⅛ to 2 h. p. motors, made by the Robbins & Myers Co., Springfield, Ohio.

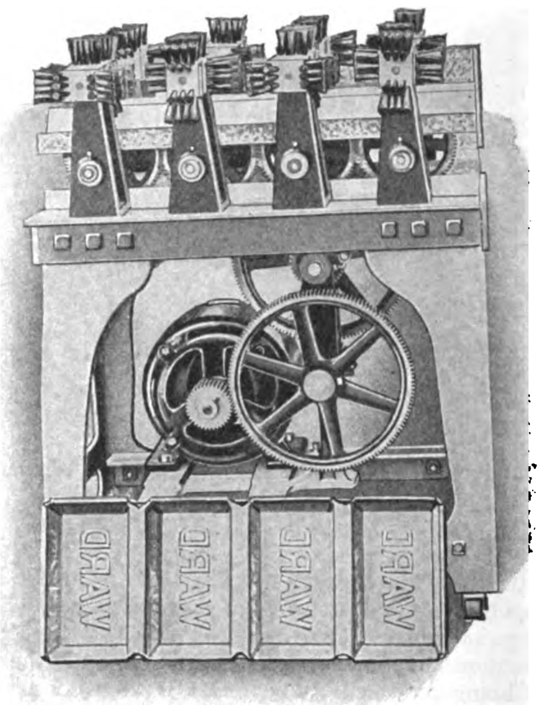
To operate, the silver is placed in the cylinder with the steel balls, and is covered with hot soap suds. The current is then turned on and the machine is allowed to operate for about 10 minutes. By centrifugal force, the pieces of silver are moved to the center, and the steel balls roll over and around them, while the steel slugs penetrate fret-work and crevices that even the smallest ball cannot enter. The silver is thus cleaned, burnished and sterilized.

The machine was just recently placed on the market by the Tahara Co. of America, Glenwood avenue and Second street, Philadelphia, Pa.

Electric Bread Pan Cleaning and Greasing Machine

The annexed cut shows an unusual motor application—a machine manufactured by Gottschalk & Co., Reedsville, Pa., for cleaning and greasing bread pans.

By means of a set of stiff brushes the pans are cleansed. Then the opposite set of soft brushes are used for greasing the pans. By cleaning the pans thoroughly before greasing them, the machine eliminates any spots on the bread. It is also claimed that the pans are greased much more uniformly than where they are greased by hand, with a great saving in lard. With the machine, one-half pound of lard will grease 2,000 pans.

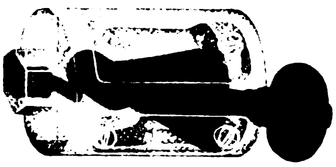


Gottschalk bread pan cleanser and greaser, operated by Robbins & Myers motor.

The machines are equipped with ¼ or ½ h.p. motors, manufactured by The Robbins & Myers Co., Springfield, Ohio. The motor is mounted on the frame of the machine below the brushes and is protected from crumbs and grease by a metal cover. The outfit is mounted on casters so it can be moved about easily and connected to any lamp socket. The average floor space required is 3 by 5 feet.

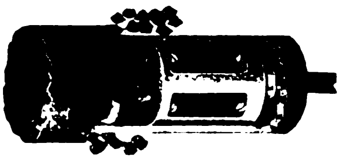
Matthews Scale Knocker

Central station operators will be interested in a mechanical device called a scale knocker which has recently been put on the market by W. N. Matthews & Bro., Inc., 3705 Forest Park boulevard, St. Louis, Mo. It clears a fire tube or water tube of scale quickly and



Scale knocker. Made by W. N. Matthews & Bro., 3705 Forest Park boulevard, St. Louis, Mo.

effectively. It is operated by air or steam pressure. It has but five parts, and is a valveless machine. The same machine can be used in either fire or water tube boilers with tubes of the same diameter. It is only necessary to change the hammer heads.



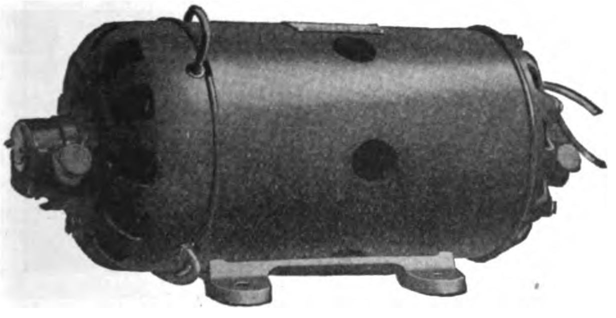
Scale knocker. Made by W. N. Matthews & Bro., 3705 Forest Park boulevard, St. Louis, Mo.

Motor-Generator Set for Charging Automobile Storage Batteries

As shown in the annexed illustration, this set consists of an alternating-current motor and a direct-current generator compactly mounted in the same frame. The motor operates from the 60-cycle, 110-volt, alternating current lighting circuit and drives the generator which furnishes the current for battery charging.

The generator is rated at 10 amperes. It can charge one or two 6-volt batteries or one 12-volt battery. Its voltage can be regulated from 6.3 volts to 12.6 volts by means of a field rheostat.

To cause the set to operate, merely connect the motor lead to the electric light socket and turn the snap switch. Adjust the generator to the desired voltage and connect with the battery. No attention or voltage regulation is required during charging. The generator is so wound that its voltage rises automatically at the end of the charge so that each cell receives 2½ volts.



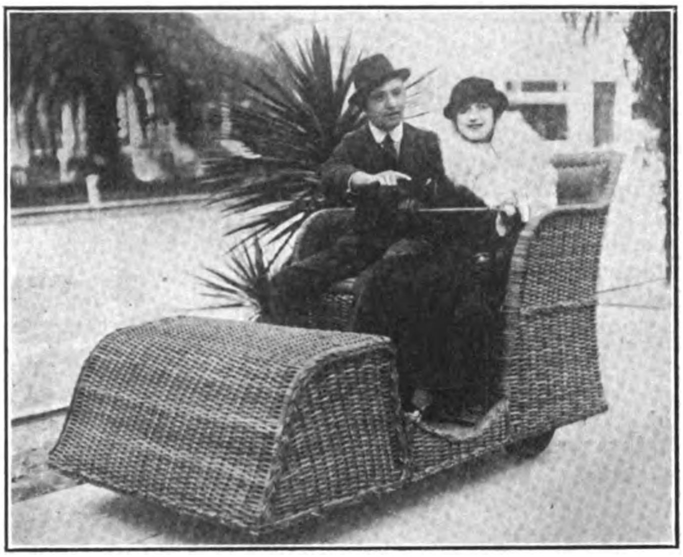
Motor-generator set for charging storage batteries for gasolene automobiles. Made by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

This set is 19 inches long, 7¾ inches wide, and 8⅜ inches high. It weighs 140 lb. It is manufactured by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Osborn Electriquette

Though this novel form of electric vehicle was designed especially for use at the Panama-Pacific expositions to be held at San Diego and San Francisco this year, it can also be readily turned to use in residence parks, restricted suburbs, and other like places where social usages require a small runabout that can be easily operated by women without menace to their gloves and gowns. It is an admirable vehicle for such purposes, and will seat two persons comfortably. Under proper restrictions it could be used to good purpose on the oceanside boardwalks.

This car operates at a speed of 3 miles per hour, about as fast as an army marches under ordinary conditions. It has a 33-inch tread, a 45-inch wheelbase, and a seat 18 inches high, 20 inches deep, and 38 inches wide. The body is of rattan. It is but an 8-inch step from the ground to the floor of the car. The car is equipped with a storage battery that will furnish energy for 8 hours on good roadways. An emergency stop is so placed that it can be reached instantly.

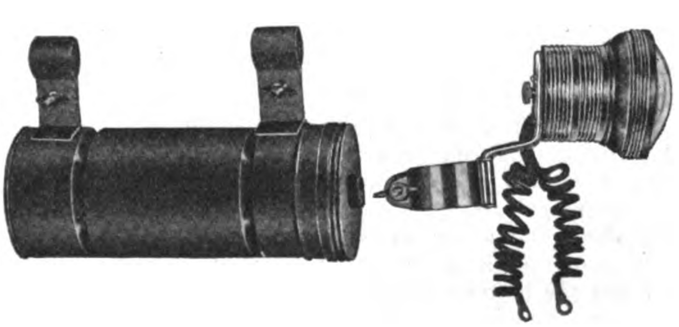


The Osborn Electriquette. Made by Electriquette Mfg. Co., 1234 South Main street, Los, Angeles, Calif.

It is made by the Electriquette Mfg. Co., 1234 South Main street, Los Angeles, Cal.

Pract-El-Lite

The Central Telephone & Electric Co., 210 North 11th street, St. Louis, Mo., is now offering the trade a new electrical device called the Pract-El-Lite bicycle lamp. A picture of it is shown below. Like the several electric hand lanterns shown in this issue, this lamp is lighted by means of a dry battery which is clamped to the top bar of the bicycle frame. This contrivance can also be used on motor cycles and all kinds of wagons.



Pract-El-Lite bicycle lamp. Made by Central Telephone & Electric Co., 210 North 11th street, St. Louis, Mo.

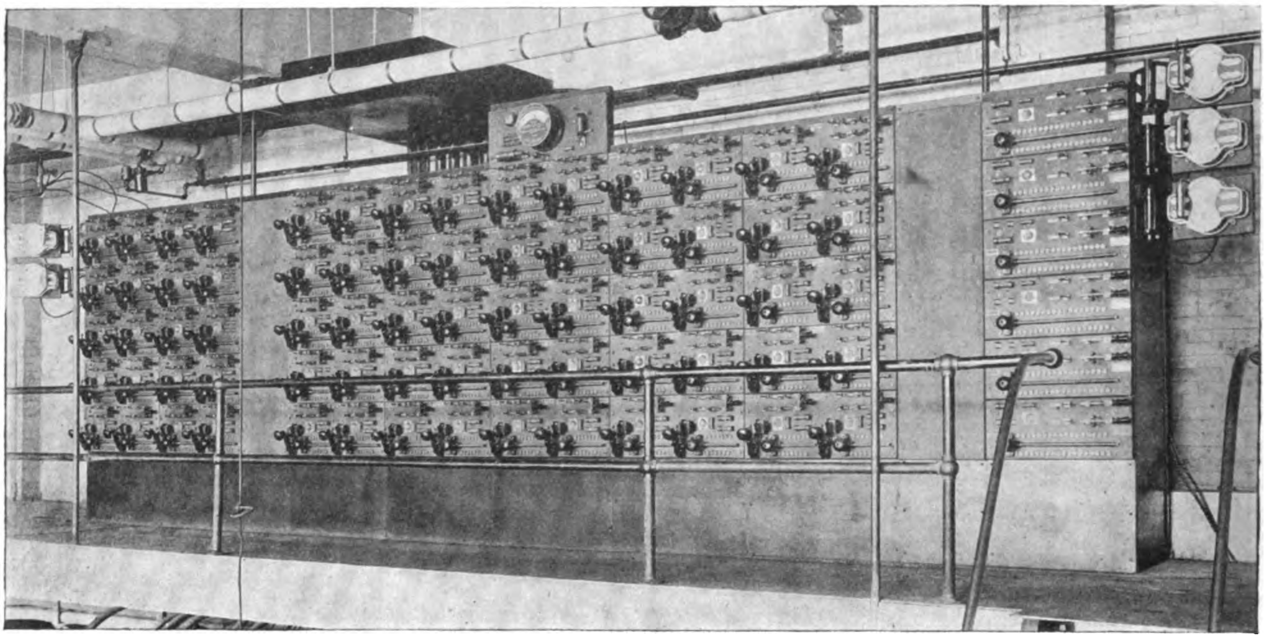
AUTOMOBILE MATTERS

ELECTRIC VEHICLES—ELECTRICAL APPLIANCES FOR CARS, TRUCKS, AND GARAGES—NEWS AND ITEMS ABOUT THIS ACTIVE BUSINESS.

The Ward Bread Co. has recently completed the building of its new Boston bakery located in Cambridge. Electric delivery vehicles will be used as in New York and Brooklyn and the same make of battery charging equipment has been installed that has been in use in the above cities for several years. The charging equipment installation in the new plant shown in the accompanying illustration is located in a gallery in the engine room adjacent to the garage proper. It consists of the unit section type rheostats built up into panels to meet the present requirement of charging 70 vehicles. Each unit takes care of two vehicles, there being seven panels of five each of these sections or a total of 35 duplex sections for charging 70 vehicles. At the extreme right there are six special sections for charging, discharging and forming batteries. A power plant on the premises furnishes 115-230 volt direct current, three-wire service.

In case the power is off or the current is reversed through the battery, the reverse current circuit breaker serves to disconnect each battery from the busbars and is so interlocked with the rheostat slider that the attendant cannot begin to charge the battery without first placing all the resistance of the rheostat in series with the battery. Each charging outlet is protected by enclosed cartridge fuses.

This charging equipment being made up in sections, permits of making additions very easily, as with a sectional bookcase, and this is an important advantage since it has been practically decided that extensions will have to be made in a short time. The charging equipment is the product of The Cutler-Hammer Mfg. Co., of Milwaukee.



Battery charging equipment, Ward Bread Co., Boston, for charging fleet of 70 electrics. Cutler-Hammer unit type charging rheostats used

In order to overcome disadvantages of limited mileage and battery troubles attendant upon the operation of an electric vehicle, and in order to increase its range of operation and usefulness and its efficiency, the multibattery system has been devised by the Klingelsmith Electric Truck Co., 76 West Monroe street, Chicago, Ill. This system is designed to eliminate the 95 per cent. of battery troubles to which all of the present vehicles are subject, and to provide, instead of the limited mileage at present obtained, unlimited mileage and service at all times.

It contemplates the construction of a vehicle with a battery designed to be readily removable and replaceable therein, so that a discharged battery can be quickly taken out and a fully charged one substituted, with practically no loss of time in the running of the vehicle. The battery is mounted permanently in a small car or carrier, with flanged wheels and ball bearings, which rests on a small T-rail track in the battery compartment in the vehicle, and is run out onto a platform, or a transfer truck with rails leading to the charging platforms; the change from a discharged to a fully charged battery being accomplished in less than a minute. These battery carriers are interchangeable in all and any type or size of electric vehicles or trucks for whatever purpose or of whatever design or style, and the battery carriers enter all vehicles in front; which is the only similar part of all pleasure cars and trucks.

Batteries assembled in the battery carriers may be of any and every voltage and ampere rate of discharge, as required for the highest efficiency and control of speed, pulling power or mileage desired. The batteries are charged outside of the car and at a low charging rate without sacrificing the running time of the vehicle, and all necessary inspection and attention can be given them before they are replaced; and it is estimated that this alone will increase the life of the batteries from one and one-half to two times. It is evident also that if battery renewals can be readily made without interfering with the use of the vehicle, the batteries need not ordinarily be discharged beyond the point of their best power and maintenance efficiency, but can be removed for replacement by fresh ones when not fully discharged, which will also greatly prolong their life; and in addition also, batteries depreciated twenty to thirty per cent., which are now scrapped, can be used up in this system on ten to thirty mile trips, getting more mileage out of the old batteries than is now obtained from new ones.

The Waverley Company, of Indianapolis, has under construction for the navy yard on Puget Sound, Washington, a three-ton electric shop truck with three-ton trailer for handling plates and angles from storage to machines and from machine to machine through the naval repair shop. The tractor is of unusual design in that with a wheelbase of 66 inches the platform of the car is 5 feet by 11 feet, the principal overhang being in front of the front axle. The battery of 42 cells is divided between two battery boxes, one between the wheels and the other under the forward overhang. Mounted on the platform of each car is a turntable 5 feet 2 inches in diameter running on rollers and operated by hand spikes for the quick and convenient unloading of the heavy plates or beams it is designed to carry. A mileage of 30 miles on a single charge of the battery is provided and a speed of 5½ miles an hour with both cars fully loaded.

J. Herbert Taylor, who for several years has conducted a garage for electric vehicles in Topeka, Kansas, has formed a partnership with A. C. Longren, formerly proprietor of the Topeka Motor Car Co., for the purpose of conducting a general garage. The new firm will be known as the Longren-Taylor Co.

The Electric Vehicle Association of America, 29 West 39th street, New York City, has some interesting data relative to the behavior of the electric vehicle in winter service, which will be sent those interested upon request.

The *Electrical Times* of London in making comment on the commandeering of gas operated motor cars for military use, says: "Central station engineers have a unique opportunity for building up a business in electric vehicles and should take advantage of the scarcity of petrol cars to commence a campaign. The example of West Ham should be followed by every electric supply undertaking in the country. Fortunately, the electric vehicle business is not controlled from Germany. Chassis and bodies can be built over here. English-made batteries, motors, and controllers are available and the importation of American vehicles has not been hindered. It is not, of course, at present possible to import cars from France or Italy, but after the war we shall be glad to welcome supplies from our allies and from neutral countries."

English and American makers have already got in touch with each other through the co-operation of the Electric Vehicle Association of America, with excellent results to the seller and buyer.

Quarantine against the foot and mouth disease now raging among cattle in fifteen states is bringing horse transportation to a standstill at state lines. But while inter-state horse-haulage is thus checked to prevent spread of contagion, the immune motor truck passes through without suspended service or delay—necessitating its adoption in place of disqualified horse teams, and pointing once more to the well-known fact that the motor truck is the eventual type. The cost of operating electric trucks in brewery trucking, lumber hauling, and in many other lines of service, is available upon request from the Electric Vehicle Association of America, 29 West 39th street, New York City.

Although the low-price electric passenger vehicle which it is said now is under contemplation by Thomas A. Edison and Henry Ford still remains beneath the horizon, says the *Scientific American,* low-priced electric freight vehicles bid fair soon to be common. Within the past few months two vehicles of the kind have appeared on the market. One of them is a four-wheeler and the other has but three wheels. Both are comparatively light in construction and are designed for the cheap and efficient transportation of small parcels. That there is a market for vehicles of the kind there can be no gainsaying, for the cost of electric current steadily is decreasing and the inherent simplicity of the cars themselves is their own most potent factor of appeal. If the same conditions existed here as now exist in Europe, such cars would soon flood the market. The commandeering of gas cars for military purposes has created a big demand for low-priced electrics.

The plan often talked of of a co-operative garage for electric pleasure vehicles has become a reality with the signing of a lease by the New York Electric Vehicle Association for a building on the southwest corner of Central Park West and Sixty-second street. A number of the leading manufacturers of electric pleasure vehicles are co-operating with the association in this undertaking. The Rauch & Lang, Detroit, and Baker companies will have showrooms in the building, making it their headquarters. The garage will start with accommodations for 150 cars, of which more than 100 have already been secured. There will be a fixed charge for privately owned cars of $45 a month, which will include battery charging, care of the car, and taking the car to and from the owner's residence and the garage. The object of the plan is to provide a large, centrally located garage where electric pleasure cars will have a home of their own and receive special care and attention.

CLASSIFICATION OF MOTORS AND SUGGESTIONS FOR STANDARDIZING VOLTAGE AND SPEED RATINGS

[MOTOR DRIVE SERIES—ARTICLE NO. 39]

What is meant by the term small motor? What is a large motor? How should motors be classified? Is there any satisfactory method of standardizing motors with regard to horsepower, voltage ratings, and speed ratings?

Various opinions exist as to the meaning of the terms small and large motors. Some say a small motor is one developing not over 15 horsepower at a definite speed, while a large motor is generally understood to mean one whose capacity is over 15 horsepower. Many, however, consider that small motors comprise all capable of developing up to one horsepower. Others divide motors into two classes—those of one horsepower and over, called large motors, and those of under one horsepower, called fractional horsepower motors. And, wide variations prevail as to the speeds at which the output of a motor shall be determined.

In an effort to classify motors and to standardize their ratings The Electric Power Club, composed at present of 22 prominent electric motor manufacturers, has been formed. The chief object of this organization is the standardization of electrical machinery (principally motors and generators) and the collection and dissemination of statistics and other information of value to its members.

The Electric Power Club has divided motors into two classes; small motors and large motors, and has designated certain voltage and speed ratings at which it is suggested the horsepower of motors be determined. Definitions of the terms small and large motors and a number of suggestions regarding speed ratings, etc., as formulated by the Club, follow. While these have been offered as suggestions, most of them have been adopted by the club, and member companies make every effort to adhere to them in so far as consistent with the class of machines developed by them. The suggestions contain much that is fundamentally correct and which it is hoped will be of material assistance in guiding the development of electrical apparatus.

DEFINITIONS

Small motor—To mean all direct and alternating current motors having frame sizes equivalent to that of a continuously rated motor of 1/4 h.p., open type, at 1,720 r.p.m., and smaller. Such for instance as are used for desk fans, office appliances, and portable vacuum cleaners.

Large motor—To mean direct and alternating current motors having frame sizes larger than that of a continuously rated motor of 1/4 h.p., open type, at 1,720 r.p.m. Such for instance as are used for operating printing presses, pumps, and street cars.

Open motor—To mean either the pedestal bearing or end bracket type where there is no restriction to ventilation other than that necessitated by good mechanical construction. Such for instance as are used for running small lighting plants, for machines where motor is set away from the machine and belted to it, and for any general use where there is little or no danger of foreign matter getting on the commutator.

Protected motor—To mean one with grid or screen covers. Such for instance as are used in exposed places where people may come in contact with the motor or where pieces of cloth, paper, or small particles of metal frequently fall on the motor.

Enclosed motor—To mean one with solid covers making the machine practically dustproof. Such for instance as are used in cement mills, flour mills, and tanneries.

Constant speed motor—To mean motors in which the speed is either constant or does not materially vary, such as synchronous motors, induction motors with small slip, ordinary direct current shunt wound motors, and direct current compound wound motors, the no load speed of which is not more than 20 per cent. higher than the full load speed.

Adjustable speed motor—To mean: 1. Shunt wound motors in which the speed can be varied gradually over a considerable range, but when once adjusted remains practically unaffected by the load, such as motors designed for a considerable range of speed by field variation. 2. Compound wound motors in which the speed can be varied gradually over a considerable range as in (1) and when once adjusted, varies with the load similar to compound wound constant speed motors or varying speed motors, depending upon the percentage of compounding. Such for instance as are used for operating a large number of machine tools.

Varying speed motor—To mean motors in which the speed varies with the load, decreasing when the load increases, such as series motors and heavily compounded motors. Such for instance as those designed for street railway service, bending roll service, and mill service in which a shunt winding is provided only to limit the light load operating speed.

Multi-speed motor (two speed, three speed, etc.)—To mean motors which can be operated at any one of several distinct speeds, these speeds being practically independent of the load, such as direct current motors with two armature windings, and induction motors with primary windings capable of being grouped so as to form different numbers of poles. Such for instance as are used to a large extent in operating machine tools.

Continuous duty—To define a condition of operation or service in which the apparatus may be called upon to run a sufficient length of time at its rated load to reach constant temperatures. Such for instance as are used for operating laundry machines and ventilating fans.

Intermittent duty—To define a condition of operation or service demanding alternate periods of load and rest, the period of rest to be sufficient to cool the apparatus to practically room temperature and the period of run in no case to exceed the time rating. Such for instance as are used for operating cranes and hoists.

Intermittent duty, adjustable speed—An intermittent duty adjustable speed motor is one which operates under load for brief or stated periods of time followed by alternate periods of rest. Such for instance as are used for a number of machine tools.

Varying duty—To define a condition of service or operation in which the apparatus is called upon to run at loads, and for periods of time, which may be subject to wide variation, but which are in no cases sufficient to cause the maximum temperatus rating to be exceeded. In no case shall the no-load losses be sufficient to cause the maximum temperatus rating to be exceeded in any part under no-load continuous operation. Such for instance as are used for operating winches.

Varying duty, adjustable speed—A varying duty adjustable speed motor is one which operates practically continuously, but whose load is subject to wide variation. Such for instance are are used for operating sump pumps.

Rated load—Rated load wherever referred to means horsepower output of motors.

Time rating—To mean the length of test run at which the specified condition of load and temperature rise shall be met.

RATINGS OF SMALL DIRECT CURRENT MOTORS

The following ratings are suggested to apply to direct current motors of ¼ horsepower and under:

Voltage ratings—115 and 230 volts adopted as standard voltage ratings for direct current motors of all sizes.

Temperature ratings and overloads—Continuous duty open type, full load 40 degrees Centigrade for all parts. Continuous duty enclosed type, full load 55 degrees Centigrade for all parts. No temperature guarantee to be given for overload.

Speed ratings—It is recommended that standard direct current small motors be rated and listed at full load speeds, approximately 1120, 1700, and 2500 r.p.m., the rated load always being understood to mean brake horsepower output. It is also recommended for small direct current motors where any other speeds than the foregoing are required, that they should be made to correspond with the full load speeds of 60 and 25 cycle alternating current motors. It is further recommended that at normal operating temperatures a variation of 10 per cent. plus or minus from any listed speed be allowed.

Shaft diameters—The following diameters for direct current small motors are adopted as standard: ⅛, 1/6, and ½ horsepower, at 1700 r.p.m., ½ inch.

RATINGS OF SMALL ALTERNATING CURRENT MOTORS

The following ratings are suggested to apply to alternating current motors of ¼ horsepower and under:

Voltage ratings—110 and 220 volts are adopted as standard voltage ratings for alternating current motors of this class.

Temperature ratings and overloads — Continuous duty open type, full load 40 degrees Centigrade for all parts. Continuous duty enclosed type, full load 55 degrees Centigrade for all parts. No temperature guarantee to be given for overload.

Frequencies—25 cycles and 60 cycles per second are recommended as standard frequencies.

Speed ratings—It is recommended that standard alternating current small motors be rated and listed at a full load speed, corresponding to 4 and 6 pole motors 60 cycle, and 2 pole motors 25 cycle, the rated load always being understood to mean brake horsepower output.

Breakdown torque—Recommended that small alternating current motors be so wound that the breakdown torque shall not exceed 250 per cent. of full load torque. Non-clutch constant speed motors having a breakdown torque of 1¾ to 2 times full load torque are adopted as standard. Non-clutch constant speed motors having a static torque of 1 to 1½ times full load torque are adopted as standard.

Shaft diameters—The following shaft diameters for alternating current small motors are adopted as standard: ⅛, 1/6, and ¼ h.p., 4 pole, ½ inch.

RATINGS OF LARGE DIRECT CURRENT MOTORS

The following ratings are suggested to apply to direct current motors of over ¼ horsepower.

Voltage ratings—115 and 230 volts adopted as standard voltage ratings for direct current motors of all sizes. (No standard voltage above 230 volts adopted as yet.)

Temperature ratings and overloads — Continuous duty open type: Constant speed, adjustable speed, and varying speed, full load 45 degrees Centigrade for commutator, 40 degrees for all other parts; 25 per cent. overload one hour, 60 degrees for commutator, 55 degrees for all other parts; 50 per cent. overload momentary without temperature guarantee.

Continuous duty protected type—Constant speed, adjustable speed, and varying speed, full load 55 degrees Centigrade for commutator, 50 degrees for all other parts; 50 per cent. overload momentarily without temperature guarantee.

Continuous duty enclosed type—Constant speed, full load 60 degrees Centigrade for commutator, 55 degrees for all other parts. Adjustable speed and varying speed, full load 55 degrees Centigrade for commutator, 50 degrees for all other parts; 50 per cent. overload momentary without temperature guarantee.

Intermittent duty, open type, protected type, and enclosed type—Constant speed, adjustable speed, and varying speed, full load 60 degrees Centigrade for commutator, 55 degrees for all other parts.

Varying duty, open type, protected type, and enclosed type—Adjustable speed, full load 60 degrees Centigrade for commutator, 55 degrees for all other parts.

RATINGS OF LARGE SINGLE PHASE ALTERNATING CURRENT MOTORS

The following ratings are suggested to apply to single phase alternating current motors of over ¼ horsepower:

Voltage ratings—110 and 220 volts are adopted as standard voltage ratings for motors of this class.

Frequencies—25 cycles and 60 cycles per second are recommended as standard frequencies.

Temperature ratings and overloads—Continuous duty, open type: Full load 40 degrees Centigrade for core and windings; 25 per cent. overload, 55 degrees; 50 per cent. overload momentary without temperature guarantee. Varying speed, full load torque and full speed, 40 degrees Centigrade for core and windings; full load torque and 50 per cent. speed, 50 degrees for core and windings; 50 per cent. overload in torque, momentary without temperature guarantee.

Continuous duty, enclosed type—Constant speed, full load 55 degrees Centigrade for core and windings; 50 per cent. overload momentary without temperature guarantee. Varying speed, full load torque at speeds between full speed and 50 per cent. speed, 55 degrees for core and windings; 50 per cent. overload in torque, momentary without temperature guarantee.

RATINGS OF LARGE POLYPHASE ALTERNATING CURRENT MOTORS

The following ratings are suggested to apply to polyphase alternating current motors of over ¼ horsepower:

Voltage ratings—110, 220, 440, 550, and 2200 volts adopted as standard voltage ratings for motors of this class.

Frequencies—25 cycles and 60 cycles per second are recommended as standard frequencies.

Temperature ratings and overloads—Continuous duty, open type: Constant speed, full load 40 degrees Centigrade for core and windings; 25 per cent. overload, 55 degrees for core and windings; 50 per cent. overload momentary without temperature guarantee.

Continuous duty, enclosed type—Constant speed, full load 55 degrees Centigrade for core and windings; 50 per cent. overload momentary, without temperature guarantee.

Intermittent duty, open type, and enclosed type—Constant speed and varying speed, full load 55 degrees Centigrade on core and primary windings; 50 per cent. overload momentary without temperature guarantee.

MARKETS FOR SMALL AND LARGE MOTORS

What are the markets for these small and large motors? Where are they used? What specific pieces of apparatus are each of the numerous types particularly adapted to drive?

Subsequent Motor Drive articles to appear in the Electrical Record starting with the February number will take up this phase of the subject and will treat of motors as being small and large, the small being understood to mean all of ¼ horsepower and under, the large of over ¼ horsepower. Information will be given as to the specific pieces of apparatus each of the different types of motors are particularly fitted to drive, and pictures will be given showing how the motors are applied to the machines mentioned.

Charging Nickel-Iron Batteries

To charge a nickel-iron battery, says the E. V. A., a direct voltage of 1.85 volts per cell should be provided If the line voltage be 2 per cent. or 3 per cent. lower than specified it will not interfere materially with the charge, the only difference it will make being at the end of the charge, at which time it will be impossible to maintain the normal rate.

The normal rate may be maintained throughout the charge. Charging may be done at double the normal rate for a one-hour boost. If the charging voltage available is such that the normal rate cannot be maintained, the battery may be charged at a lower rate for a longer length of time. The minimum rate that should be maintained throughout a charge is 20 amperes for the A-4 type of cell, 30 amperes for the A-6, 40 amperes for the A-8, 60 amperes for A-10, and 70 for the A-12.

The normal charge rate of the	A-4	type is	30	amperes
" " " " "	A-6	"	45	"
" " " " "	A-8	"	60	"
" " " " "	A-10	"	75	"
" " " " "	A-12	"	90	"

A 7-hour charge at normal rate is taken as normal charge. As a general rule, the nickel-iron battery is practically charged when, all the conditions being normal, the voltage has exceeded 1.8 volts per cell, and has remained constant for a period of 30 or 40 minutes. Over-charging is not harmful, but necessitates frequent filling of cells, wastes current, and is apt to cause excessive heating.

The output will not be so good if the temperature during charge is below 70° F., but the nearer the temperature can be kept to this minimum figure, the better will be the results, both as to immediate output and life.

The normal discharge rates are the same as the normal charge rates, 30 amperes for the A-4, 45 amperes for the A-6, etc.

The average discharge voltage of any type working at its normal rate, is 1.2 volts per cell, and the discharge is practically complete when an average of one volt per cell is reached.

The total normal output of each cell is as follows:

A-4	type,	150	ampere	hours
A-6	"	225	"	"
A-8	"	300	"	"
A-10	"	375	"	"
A-12	"	450	"	"

The capacity of a nickel-iron battery increases for some time after it has been put into service. A battery will give not less than the rated output when new, if charged normally; but after working some time, it will have better efficiency, and will give a greater output. A nickel-iron battery may be left for an indefinite period in either a charged or discharged condition without deterioration.

The electrolyte in a nickel-iron battery is a 21 per cent. solution of potash, containing a small amount of lithium. Both of these ingredients are alkaline. The normal specific gravity of a 21 per cent. solution of potash is 1.200.

The solution should be changed every 8 or 10 months, the old solution emptied out and the new solution put in. The cells should not stand empty for more than a few minutes.

Special potash solution for refilling nickel-iron cells may be obtained from the manufacturers of the battery. Quantities for various type cells are as follows:

A-4	cell,	1000	cubic	centimeters,	or	2.64 lb.
A-6	"	1500	"	"	"	3.96 "
A-8	"	2000	"	"	"	5.28 "

The proper height of the solution is one-half inch above the plate tops. Never allow the solution to get below the tops of the plates. Nothing but pure water should be used for filling. Distilled water is the best.

The frequency of filling depends entirely upon the number and extent of charges that have been given the battery. In some cases batteries must be filled twice a week, in others once.

CENTRAL STATION MISCELLANY

In one of the most efficient steam plants in the United States, that of the Interboro Rapid Transit Co. in New York, Fifty-ninth street station, in order to develop one hundred heat units at the bus bar, nine hundred and seventy heat units must be thrown into the furnace in the form of fuel. With grades of fuel ranging between 14,000 and 15,000 heat units per pound, the average gas plant utilizes a little over one pound per horsepower; the steam plant three pounds.

No doubt many of our readers will be interested in hearing how Chas. F. Scott happened to develop the well-known Scott two-phase, three-phase transformer connection. We have recently heard the inventor of this connection tell the story himself, and, in order that posterity may be sure of the facts in the case, we repeat the story here substantially in Mr. Scott's own words:

> You ask the story as to the finding out about the two-phase-three-phase transformer connection. It happened somewhat as follows: the Westinghouse company was advocating the two phase system as desirable for distribution in cities, for lighting and for power. In general, the generators were small, and the facility for regulating the voltage for lights was much greater when there were two circuits instead of three. It was announced one day that the company was in competition for a transmission plant, and that the saving in the line conductors would amount to a number of thousand dollars if three-phase instead of two-phase could be employed in the transmission. I stated that what we ought to have was some method by which three-phase could be used in transmission and two-phase in distribution. I said that possibly some method could be worked out. I went to my desk, drew an equilateral triangle on a piece of paper, and then dropped a perpendicular from one of the corners. It flashed upon me at once that there was the solution to the problem. I presented it to others and a test was made in the laboratory, which indicated that it was all right. The solution, therefore, seems to have resulted from commercial necessity and from plane geometry.

The Southport Light & Power Co., Southport, N. C., has recently added a new outfit to its plant consisting of a 100-hp. Kingsford boiler, a 78-hp. Harrisburg-Fleming engine, and a 70-kw. Crocker-Wheeler generator. This company intends to contract with the town of Southport to do all the pumping from the municipal water works. Before effecting this contract, however, reorganization will be necessary. Any one interested in such reorganization is requested to communicate with the secretary of the company.

The contractors who accepted work under the plan offered last year by the Boston Edison Co. were recently entertained at dinner by Mr. Atkins, of that company. After dinner Mr. Atkins told the contractors that over a year ago he stated there were over 160,000 unwired houses in Boston Edison territory. "During the year," he continued, "you have helped us and we have helped you put wires into 1247 of these houses, which means over 100 per month. This is a record to be proud of. But this represents less than one per cent. of those still without wires, so there is still plenty of work ahead. The number of houses wired during the year represents $105,000 worth of business for the contractors, supply dealers, and manufacturers, which has been financed by the Edison Company, in addition to $1,600 paid in compensation to the contractors for getting part of the business. Besides the houses that have been wired, there have been 1,256 stores, representing $28,000 of business and $800 in compensation. In other words, this campaign in less than one year has been instrumental in providing $134,000 of business and $2,400 in compensation for you, while adding to our lines 1,247 houses and 1,256 stores."

The most attractive holiday showroom in Brooklyn last month was maintained by the Edison Electric Illuminating Co., at 360 Pearl street. The display included the latest conceptions in electrical goods. The public's interest centered in a large electrically lighted Christmas tree, and in samples of electrically cooked refreshments.

The report on the municipal light plant, of Youngstown, Ohio, was accepted by the city council at a recent meeting. The report embodied a complete layout of street lighting. The general systems consist of 3400 100-candle-power nitrogen tungsten lamps, while the business district is lighted by 243 1000-candle-power and 73 600-candle-power nitrogen tungsten lamps on ornamental lighting standards. The wiring for the "white way" system will all be underground. The course of action which the city is advised to take is embodied in the following quotation from the report: "We recommend that negotiations be taken up with the lighting companies with a view of obtaining their best prices for lighting according to these plans, and if reasonable prices cannot be obtained, that the city proceed with the municipal lighting plant and distributing system." The report was made by H. Whitford Jones & Co., consulting engineers, of Cleveland, Ohio.

H. E. Stevens, superintendent and manager of the Municipal Electric Light & Power Co., at Pelican Rapids, Minn., supplies us with an interesting paragraph about electric service in that part of the country. He says:

> Our town is a small place of about 1,000 people. The plant is 9 years old, and never was a success until the last two years. In fact it went behind the first 7 years of its life. During the last 2 years we have wired some 40 new places, added to many that already had lights, placed about 100 flat irons, built several new lines, established a white way, started a day service, and put in several motors. Things are looking up, which shows what can be done with the right man at the head when he is let alone to work things out. City councils that know nothing about the electric business can never do it. The manager of this plant has as his motto: "Put it up to me, and if I don't make good get someone who will." It is working out well in this case.

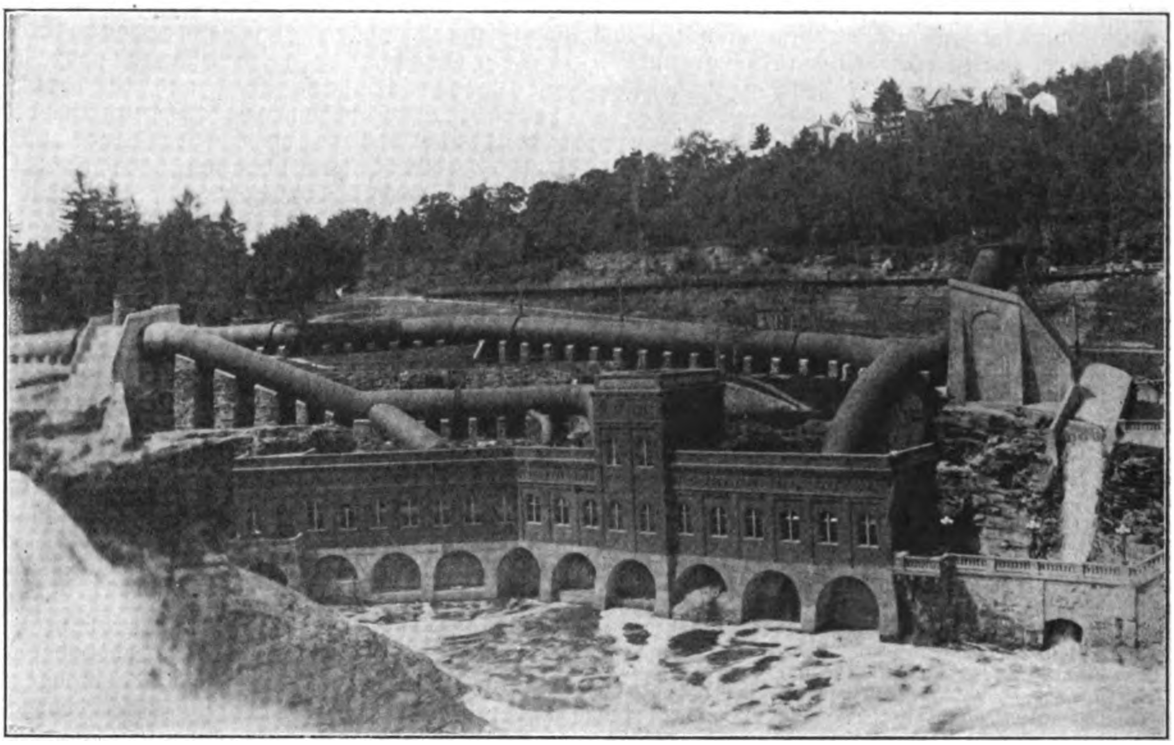
Bellows Falls Hydroelectric Plant

Rumford, Maine, on the Androscoggin River, is a community whose energies are devoted mainly to the manufacture of paper and its products. One mill produces a train load of print paper every day; another mill turns out a vast quantity of the same product, and a paper bag factory makes 15 million paper bags a day. All this vast activity occurs in a town of only about 7,000 people.

The source of the mechanical power used in the plants is the waters of the Androscoggin River. In large part the steam flow is used for electric generation, a fall of 100 feet being available on the water wheels of the generators; but below the hydroelectric station the river gives into a canal which by a fall of 50 feet gives hydraulic power for paper mill operation, debauching into a lower canal which in turn gives a 30-foot head for the mechanical drive of another factory.

The hydroelectric generating station is owned and operated by the Rumford Falls Power Company, with offices at Rumford, a half mile below the station on the river. The waterpower at the present site has been utilized in increasing volumes during a century past. The township was a grant from the Legislature of Massachusetts, which State then included the present State of Maine, to Count Rumford, the eminent scientist and American patriot, in recognition of his services to the Colonies.

The first uses of the power were for driving the water wheel of a grist mill. The earliest hydroelectric station here was built in 1892 by the Rumford Falls Light & Water Company, this corporation now being the organization which supplies street and commercial lighting, and also water, to the community. The late Hugh J. Chisholm was the originator of the water-power generating plant and carried forward the work during the remainder of his active and useful career. Mr. Chisholm's interests embraced a wide sphere of activities, including the establishment at Rumford of a model community of industrial workers' homes, which is conducted under the name of the Rumford Falls Realty Company.



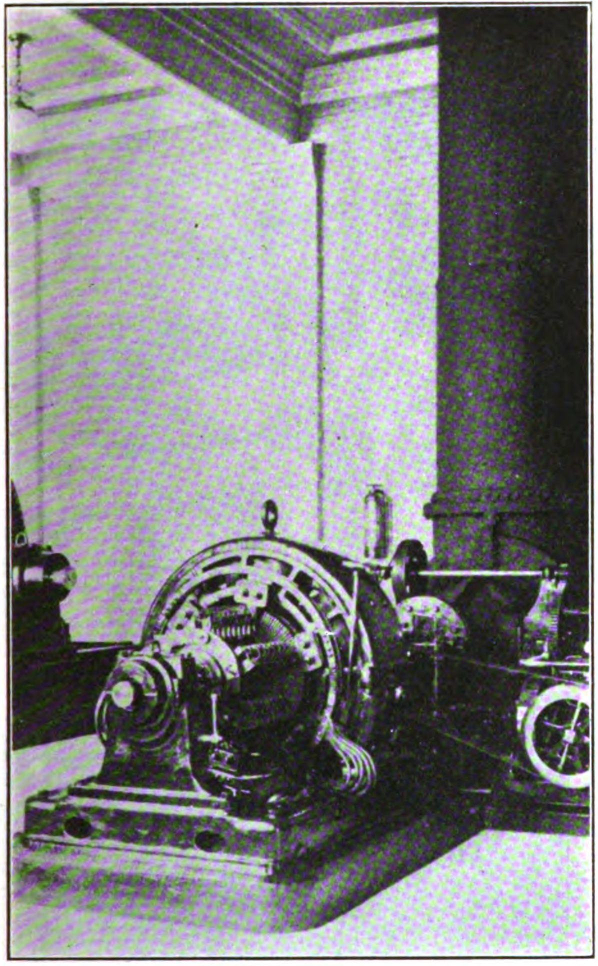
Generating station of the Rumford Falls Power Co., Rumford Falls, Me.

The earliest hydro plant consisted of a 300-horsepower water wheel belted to four small generators, single-phase, operating on 125 cycles, located in a wooden building on top of the cliff above the wheel house. A head of 55 feet was utilized at that time. Later a direct current, 500-volt generator was put in to provide local power service. A few years after, a pair of wheels giving 600 horsepower were added, and a brick station built. The first direct-connected apparatus was located on the present station level at the base of the cliff in 1900.

The beginnings of the present station were constructed in 1909, when a 400-kw. and soon after a 550 and an 800-kw. direct-connected machine were installed, the small generators on the hill being done away with. In the latter year a 4,000-kw. generator with 5,000-hp. water wheel, was installed; two years later a second generating unit of the same type and capacity was added, and the three generators then in service were placed in combination, with a 2,700-hp. water wheel direct connected on the same shaft to drive them. The present equipment consists of these three principal units, but the development is yet to be amplified, as it is planned before long to erect a new station a short distance below the present one, and equip it with six 4,000-kw. units, there being ample flowage in the Androscoggin the year round to supply machines demanding that capacity.

The hydraulic conditions are very favorable to the uninterrupted use of the river. Four mill and power companies that utilize the stream, of which the Rumford Falls Power Company is one, co-operate in regulating the flow, and, through the regulation provided by a dam at the outlet of the Rangely Lakes, have added 30 per cent. to the normal waterpower available.

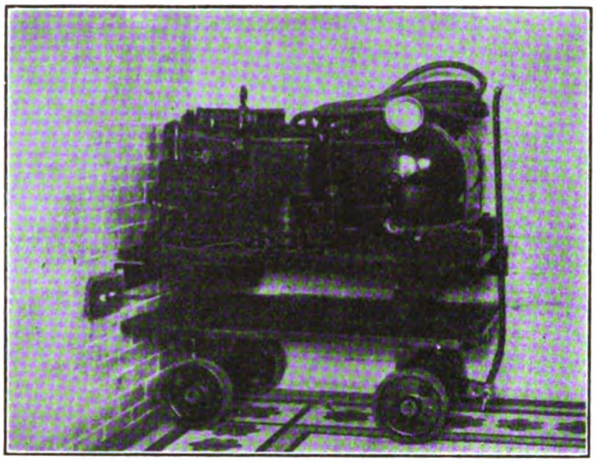
A wooden crib dam with rock facing was built for the local development in 1892. This dam sets the river back a distance of 8 miles and covers shallows, thereby freeing the stream of troubles from anchor ice. The same dam is still utilized, though the projected new station will involve the construction of a concrete dam a short distance below the present structure.



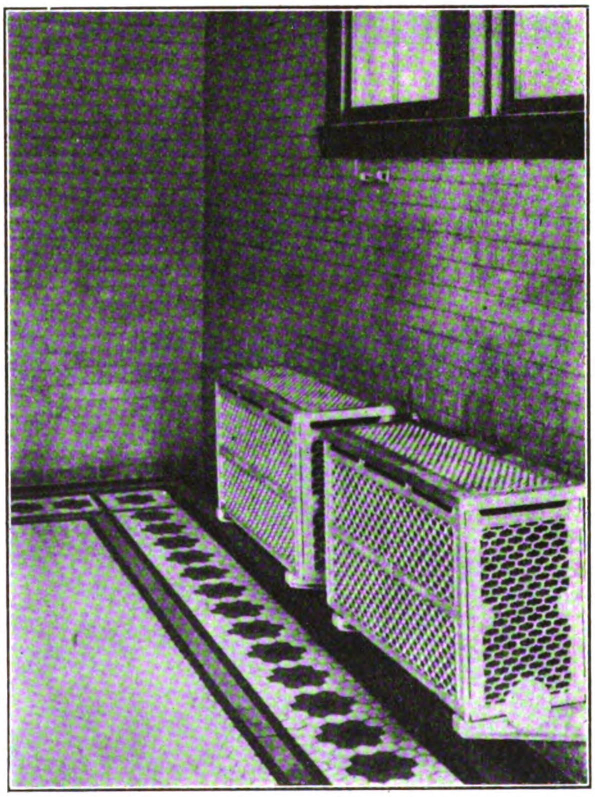
Water wheel regulator and 100-kw. exciter in the plant of the Rumford Falls Power Co., Rumford Falls, Me.

The crib dam is 250 feet long, and from its western end a canal is provided, one side being formed by the rock wall defining the stream, and the other by a concrete wing. The canal thus formed is about 60 feet wide, 18 feet deep, and 100 feet long; and delivers the waters to two headgates, now hand operated but soon to be motorized, built by the Holyoke Machine Company, Worcester, Mass. A Holyoke sluice gate gives an outlet through the side of the canal into the river.

From the headgates two penstocks lead 1,200 feet to the station, entering the latter through the roof. The penstocks are 14 and 13 feet in diameter, respectively, and are covered with woven felt and asbestos roofing; and so far as they run side by side are enclosed in a casing of 1-inch boards. A surge tank is provided at the lower end of each penstock, each encased in a solid reinforced concrete structure, with hollow pan around the tank to receive the overflow and a stair spillway to carry the water into the river. One of the penstocks is built protruding through the concrete casing at an angle; the top being horizontal, and thus elliptical, gives an ampler overflow than would be provided by the top of a vertical tank. Each surge tank is of the same sized steel pipe as the corresponding penstock.



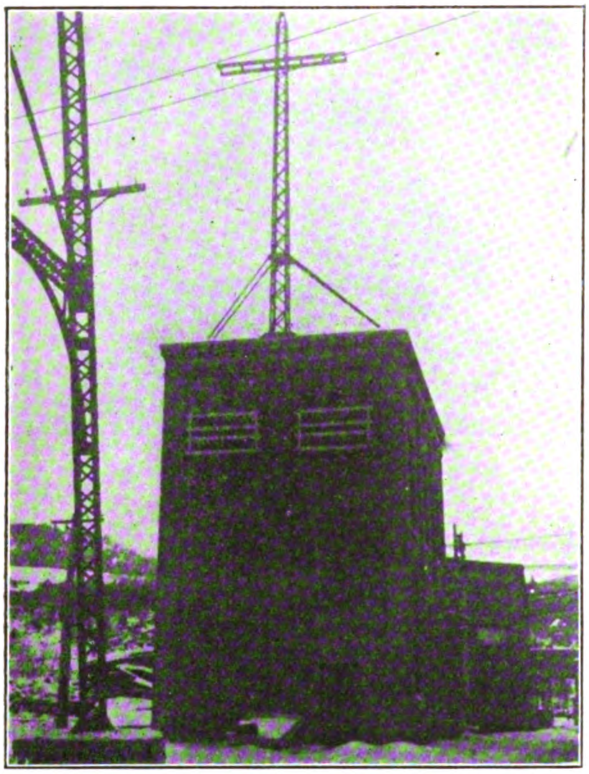
Allis-Chalmers motor driven compressor used for station and machine cleaning. Rumford Falls Power Co., Rumford Falls, Me.



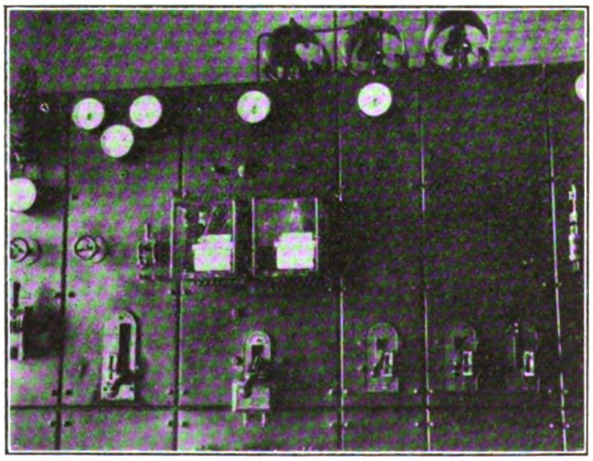
Simplex electric radiators in plant of Rumford Falls Power Co., Rumford Falls, Me. Twelve of these radiators are used in heating the station

The generating station is of brick, the main or operating room being about 200 feet long and 30 feet wide. The building follows an angle in the side of the cliff, at the base of which it is built.

The three turbines are of Holyoke Machine Company manufacture and operate at 400 r. p. m. The generators are Westinghouse, of the revolving field type, and wound for 2,300 volts, 40 cycles. Two of the wheels being of 5,000-hp. rating, each are direct connected to the two 4,000-kw. generators. The third wheel, of 2,700 hp., drives the shafting on which the three generators are mounted in combination, with an aggregate rating of 1,750 kw. The shaft is provided with couplings, so that one or more of the generators can be operated apart from the others.



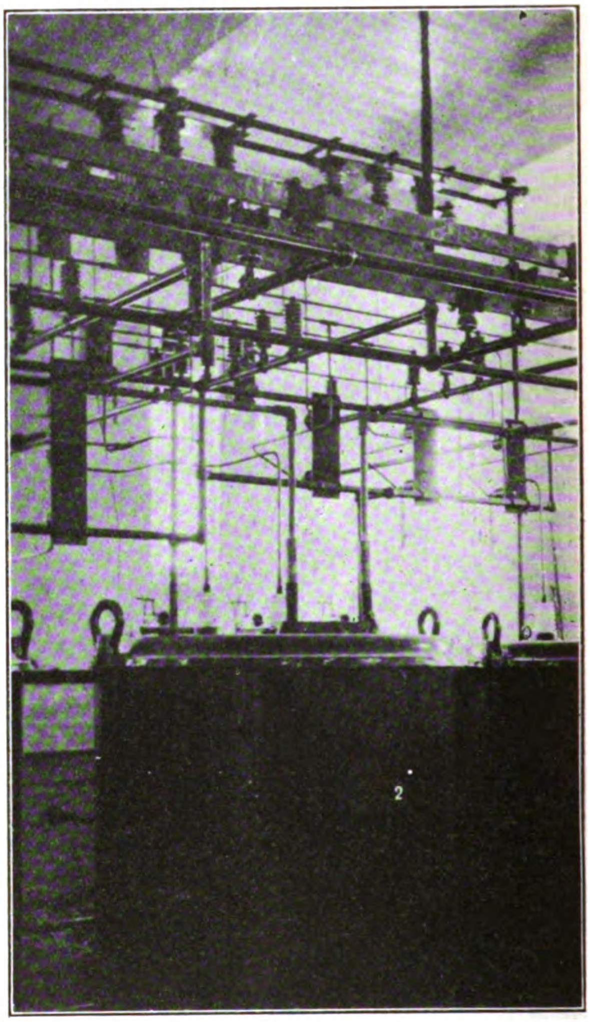
Sub-station No. 3. Rumford Falls Power Co., Rumford Falls, Me.



Switchboard for motor-generator set. Maine Coated Paper Co. Rumford Falls Power Co.

The 13-foot penstock supplies water to one of the 5,000-hp. wheels, while the 14-foot penstock supplies water to the other large unit and through a 10-ft. penstock tapped off the main pipe supplies the 2,700-hp. wheel operating the combination unit. A 3-ft. penstock also tapped off the 14-ft. pipe supplies water to a 100-kw. water wheel-driven exciter. Another exciter of 85-kw. rating is driven by a belt from the shaft of one of the 4,000-kw. units, while a 45-kw. exciter is belt-driven from the combination generator shaft and a small exciter of 10-kw. rating is direct connected on the same shaft.

Improved governors, manufactured by the Holyoke Machine Company, control the water supply to the wheel cases, and a hydro-chronograph, manufactured by Barrett & Lawrence, Inc., Philadelphia, Pa., is installed in connection with each of the wheel gates to record the gate openings. This special application was devised by Charles A. Mixer, the power company's engineer, the instrument being ordinarily used to record water levels in reservoirs, canals, and rivers. By means of the application of a new gear, the travel of the recording pen was given its proper relation to the travel of the gate, and thus a new and valuable use of the hydro-chronograph was inaugurated.



Transformers and 11,000-volt busbar structure, Sub-station No. 1. Rumford Falls Power Co., Rumford Falls, Me.

The station is admirably lighted by the use of 29 groups of four 40-watt mazda lamps installed in 14-

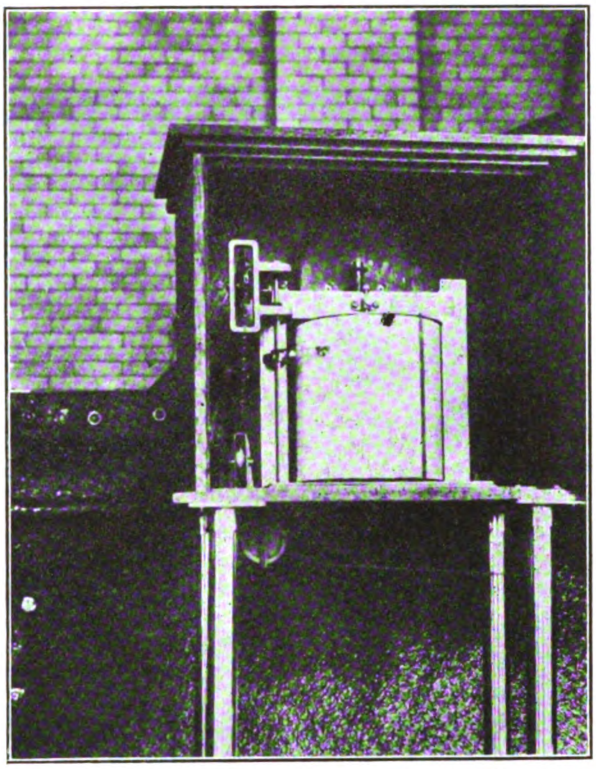
inch translucent globes pendent on chains about 2 feet below the ceiling and 15 feet above the floor. The repair shop and engineer's office are separate rooms, the latter above the former, at the upstream end of the building. Each of these rooms is centrally lighted by one of the groups. In the shop a 3-hp. General Electric induction motor is installed against the wall about 8 feet from the floor, to drive a repair outfit.

The station switchboard consists of 21 variegated dark marble panels, and is about 58 feet long and 11 feet high. The board carries measuring and switching apparatus, one panel being set apart for station lighting and one for heating. The station heating is by means of ten Simplex grid type electric radiators ranged along the outer wall of the operating room, and single units in the smaller rooms.

The switchboard stands 5 feet in front of the wall, and behind it are located the generating oil switches; the oil switches for the 2,300-volt outgoing circuits are located in a fireproof brick apartment in the upper part of the building. The transformers for street lighting service in Rumford are in a room above the generating room. A wire tower is located on the roof, where all outgoing lines are dead-ended. Westinghouse lightning arresters with choke-coils are installed here.

On the top of the cliff above the generating station is sub-station No. 1, in which are located three 2,500-kw. Allis-Chalmers water-cooled transformers rated 2,300/22,000-volt and operated at present on 11,000 volts, on the transmission line which supplies energy to industrial plants already mentioned. In this connection, high-tension General Electric aluminum-cell lightning arresters are installed. Low-equivalent Westinghouse arresters are installed on the 2,300-volt incoming lines from the generating station. Two pumps to provide river water for transformer cooling are each driven by an 8-hp. Allis-Chalmers induction motor.

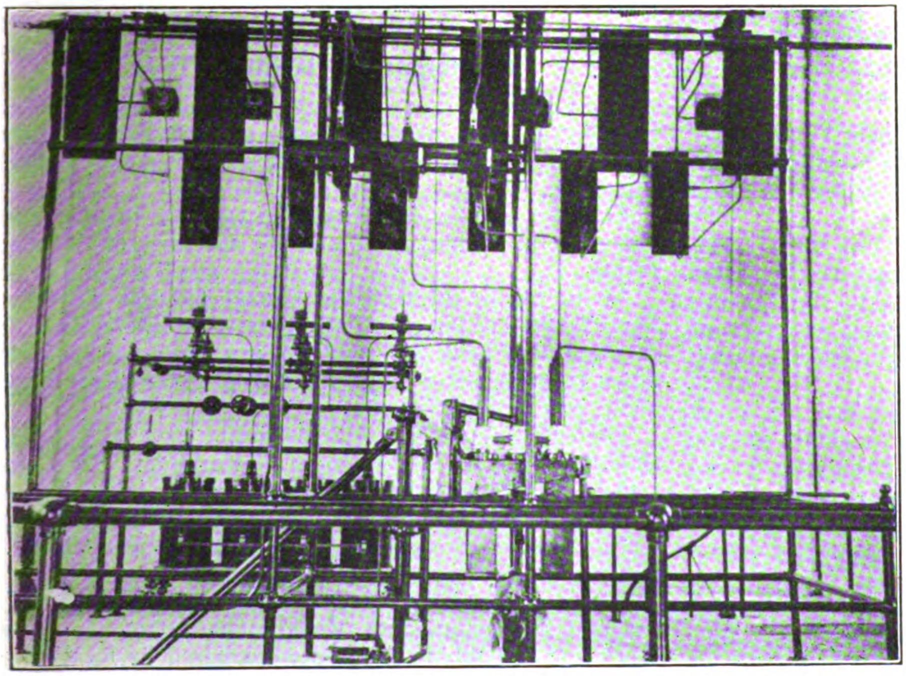
The two three-wire lines of the 11,000-volt transmission system cross the river from this sub-station and are dead-ended to a steel structure erected independently of and just outside the east wall of the station. This line is only lately put in operation, replacing four 2,300-volt lines formerly used for transmission. The new line is about one mile in length, built over private right of way, the topography enabling construction in an almost straight line and at the same time avoiding the built-up part of the town. The line has its terminal in Sub-station No. 3, in the yards of the Oxford Paper Company. Another sub-station, known as No. 2, is located at an intermediate point to furnish 2,300-volt energy to the Continental Paper Bag Company, the Maine Coated Paper Company, and the Fort Hill Chemical Company; to the first two concerns for power, and to the latter for electrolytic reduction.



Barrett & Lawrence hydrochronograph. Rumford Falls Power Co. generating plant, Rumford Falls, Me.

In Sub-station No. 2 are three 50-kw. step-down transformers rated 11,000/2,300 volts. The power conductor on this line is 2-0 bare copper. From a point a half mile below the first sub-station an 11,000-volt single circuit line connects the town of Dixfield, 5 miles distant, supplying street, commercial, and house lighting service to that community. The construction of the main power transmission line is on chestnut and cedar poles 30 to 60 feet high and spaced at 125-ft. intervals. Double cross-arms are used, with the Thomas pin-type insulator, tested for 30,000 volts. The wire was obtained from the American Electrical Works, Providence, R. I.

From Station No. 2 to No. 3 the line is carried in part over the lower canal and over the railroad and paper mill yards. Here five structural steel towers, built by R. D. Coombs & Co.,

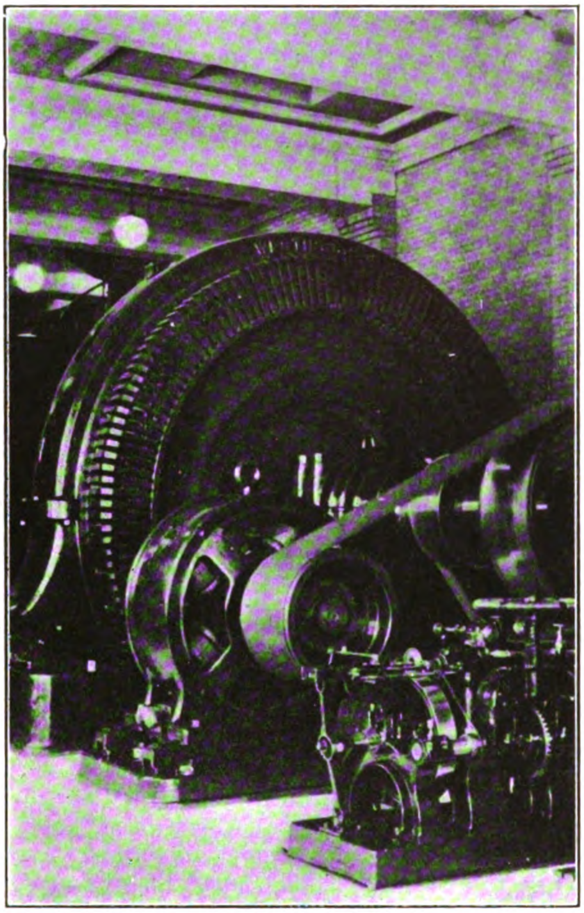


High tension wiring, disconnecting switches, and lightning arresters. Rumford Falls Power Co., Rumford Falls, Me.

New York, support the cables at a height of 70 feet.

The wishbone arm construction is employed on the transmission line to Dixfield, the insulators being spaced on a 30-inch triangle. These arms were supplied by the Thomas Company.

Sub-station No. 3, in the Oxford Mills yard, is a brick structure 40 ft. long, 30 ft. wide, and 36 ft high, and consists of two stories and basement. The basement contains two motor-driven pumps to supply water for transformer cooling from a well below the basement floor.


One of the 4000-kw. generators with 85-kw. exciter belted to shaft in the plant of the Rumford Falls Power Co., Rumford Falls, Me.

The ground floor of the station contains three 2,500-kva. Allis-Chalmers water-cooled transformers, rated 22,000/2,300 volts, for energy supply to the Oxford mills. On the second floor are lightning arresters of the same type and capacity as those installed in Station No. 1.

The Oxford mills have a connected load of about 5,300 horsepower and use an average of about 100,000 kilowatt-hours a day, a large part of the motor-driven machinery being operated 24 hours a day, seven days a week. The power company's total output averages about 125,000 kilowatt-hours per day, on a basis of 325 days a year.

The paper mill uses are for driving pulp beaters, and for operating an electrolytic bleach plant.

The Maine Coated Paper Company has motors installed aggregating about 350 horsepower, of which about 250 horsepower are in variable-speed motors operated by direct current produced through a synchronous motor-generator installed in a sub-station on the premises. By this means a better power factor is obtained, thereby effecting a saving of energy consumption.

The Fort Hill Chemical Company uses electrical energy to the maximum amount of about 300 connected horsepower, for electrolytic reduction service in the manufacture of chlorate of potash.

Street, commercial, and house lighting service is provided in Rumford, through the Rumford Falls Light & Water Company, at a 10-cent maximum rate. The use of nitrogen-filled lamps for street lighting is being introduced.

Ultra-Violet Light Rays Destroyers of Toxines and Bacteria.

Ultra-violet rays not only kill bacteria but they also destroy toxines, as many laboratory experiments have proved. This fact seems to give an explanation of the healing effect of the light bath, the effect of which was always somewhat mysterious. It seems quite possible that the blood is exposed right near the skin during its circulation from the artery to the vein system to the ultra-violet light and gets more or less sterilized thereby and freed of its toxine contents. Ultra-violet rays have also been used for many reactions, such as bleaching and the production of chemical compounds. None, however, have attained the industrial application that the sterilization of water has accomplished.

The great source of ultra-violet radiations and "the cheapest disinfectant known," as Duclaux puts it, is the *sun*. Rivers and lakes are freed from a great part of their bacterial contents by the bactericidal power contained in the sun's rays. The spectrum of the sun is in itself not very rich in ultra-violet rays of short wavelengths, the shortest being .29μ. However, in high altitudes where the light of the sun has to pierce a smaller layer of air it is much richer in ultra-violet, as may be seen from the fact that sunburns are quickly produced if we expose ourselves in high altitudes—mountains or balloons—to the sun.

Municipal Christmas Trees

The Columbia Electric Engineering Co. was awarded the contract for installing 3,000 colored lights on the Municipal Christmas Tree this year, on Boston Common.

This tree was 60 feet high, and was cut down by the Governor of Maine, and was a fine specimen of the pine forest.

At the top of the tree was a large red star with two hundred 16-c.p. lamps. The lights were interwoven all through the branches, and twenty festoons brought down from the top of tree to a ring of green at the base, about 100 feet in diameter.

The entire job was completed in five days, and necessitated the use of a large force of workmen. The current was supplied through 600,000 circular mill feeders.

At the official opening, addresses were made by Mayor Curley, and other dignitaries. The lamps were lighted by Mrs. Curley operating a push button.

New York had five large Christmas trees similar to the one in Boston, and Brooklyn had two. In New York and Brooklyn the trees were wired by local contractors. The lighting service in New York being furnished free by the New York Edison Co. and in Brooklyn by the Brooklyn Edison Co.

TECHNICAL SCIENTIFIC — FINDINGS — PHILOSOPHICAL THEORETICAL

In Boston not long ago, says a society circular letter, a fire broke out in the basement of a building occupied by a wholesale paint and chemical concern. The fumes and smoke became so thick that it was impossible for the firemen to enter the basement or direct a stream with any effectiveness, when someone thought of electric fans. A half dozen of the ordinary 16-inch size were quickly requisitioned by the fire chief and their breeze directed down the stairway. As soon as the rear basement windows were broken to allow the escape of the smoke and fumes, the fans gradually cleared the basement so that the firemen could get to work and put out the flames.

The heartwood of cypress is noted for its decay-resistant properties.

Wolfram, an important source of tungsten, is said to be quite widely distributed through Siam, where its production on a commercial scale is a recent development. According to a recent consular report, it was long known to the Chinese tin miners in Siam as "dead ore," and supposed to be of no value, until some of the ore was taken to Singapore for analysis and found to be wolfram. Great heaps of this supposedly worthless material had been left by the tin miners in the mountains of Nakawn Sitamarat (Nakon Sri Tamarat), in the Malay peninsula.

Mines used in marine warfare, says the *Scientific American*, are of three types—first, ground mines, which are usually of great size and laid directly on the bottom; second, anchored mines, which are attached by a cable to a weight on the bottom, and are designed to float at a predetermined depth, such that they will touch and be detonated by passing ships; and third, floating mines, which are dropped on the surface of the water. It is probable that the majority of the mines which have been planted during this war are of the second or anchored type, arranged to be discharged automatically when they are struck by a passing vessel.

For propulsion of submarines when submerged the use of internal combustion engines and steam boilers is precluded because of their use of air or oxgyen and because of the noxious gases formed. Compressed air and stored steam (or hot water) have their limitations as to storage capacity and are unsatisfactory in other respects. The electric storage battery is the source of energy usually employed. With such accumulators there is nicety of control, no expenditure of air, no change of weight accompanying the delivery of energy, and the batteries can be distributed in convenient places in the hull of the vessel. However, because of their relatively great weight and volume, their use involves a limited capacity and reduced radius of action. They are affected by the heat when in the tropics, and with some types provision must be made for the changing level of liquid when diving and for the elimination of the poisonous gases issuing from them if sea water is present. For submerged motive power closed cycle oil engines were tried in France but have been abandoned.

The test and certification of watches, chronometers, and other time pieces has been carried on for many years at the Kew Observatory in England, at the Besançon Observatory in France, and at the observatories of Geneva and Neuchatel in Switzerland, but no such tests have been made for the public in this country, except for a few years at Yale University, many years ago. This line of work is now started at the Bureau of Standards, and a circular under the above title is being issued, giving the regulations under which the tests will be made, the methods employed, together with sections on the use and care of watches, and on standard time and the sources of reliable time standards with which one may make frequent comparisons of his watch.

To normal vision red is beyond all question the most effective color for a danger signal, said Wm. Churchill at a recent meeting of the Illuminating Engineering Society. It is quite true, of course, he continues, that the eye is far more sensitive to light in the middle of the spectrum than toward either extreme, but of much greater importance is the fact that as the apparent size of the source diminishes red never ceases to look red. Its chromatic and achromatic threshold are always the same. This is not strictly true of any other color although a good signal green approaches close to such a requirement. This fact which has been recognized in practice ever since railroads began to use red lights in signaling is corroborated by numerous experimental researches of recent years.

About the middle of the eighteenth century Franklin and others clearly demonstrated that the lightning of a thunderstorm and the discharge of an ordinary electric machine are identical in nature, and thereby established the fact that many of the properties of the former may logically be inferred from laboratory experiments with the latter. There is, however, one important source of difference between the two phenomena that does not seem always to be clearly kept in mind; namely, the distribution of the charge. In the one case, that of the laboratory experiment, the charge commonly exists almost wholly on the surface of the apparatus used, while in the other, that of the thunderstorm, it is irregularly distributed throughout the great cloud volume. Hence the two discharges, lightning and laboratory sparks, necessarily differ from each other in important details.

Low Voltage Transformers

Low voltage transformers may be divided into three classes: bell ringing transformers, toy operating transformers, and lighting transformers. All three classes are designed on the same principle, and operate under similar conditions. All three of these transformers, as well as any other type of transformer, is used for but one purpose; that is, to change the pressure or voltage from one value to another. This pressure may be increased, or it may be decreased. Transformers that decrease the pressure are known as step down transformers; those that increase the pressure are known as step-up transformers. Step-up transformers are chiefly used in street railway, light and power, and high tension transmission plants. These transformers are used only for transmission purposes. Step-down transformers are used, not for transmission, but for distribution purposes. They reduce the electrical pressure or voltage from transmission pressures of 1000 volts or over to ordinary working pressures of 220 or 110 volts. These step-down transformers may be seen by any observing person on poles, sides of buildings, or other places where service wires are carried from a transmission line to a house. Some step-up transformers are used in laboratory and medical work for producing extremely high voltages.

The transformers that we are dealing with here are all step-down transformers. Instead of stepping down the pressure from 1000 or more to 220 or 110 volts, so that it can be used for ordinary power lighting or heating purposes, these transformers take what might be called an additional step, and reduce the pressure from 220 or 110 volts to pressures suitable for lighting sign lamps, operating house bells or buzzers, or operating small motors such as those used to drive mechanical toys and similar devices. These transformers are also used for lighting the lamps now extensively employed for illuminating Xmas trees. Other types of low voltage transformers are used in the operating booths of motion picture theatres. With transformers of this type, however, we are not concerning ourselves at this time. We shall discuss the subject of motion picture transformers in a future article.

In the appended table we publish the names and addresses of all the makers of such low voltage transformers as we are discussing here, giving in each instance all the details of these transformers that have been furnished us by the makers themselves. It should be understood, however, that this table is not exhaustive. It does not pretend to cover all the different types of each class of transformer now being marketed by the manufacturing companies. The details as to primary and secondary pressures, cycles, capacities, dimensions, and weights, concern only one type of each class of transformer. Details about the other types can be obtained from the manufacturers themselves or from their catalogues.

An examination of the table will disclose that the voltages at which sign lamps and door bells are operated is pretty definitely established in both instances. Sign lighting transformers, it will be seen, take 110 or 220 volts on the primary side, and deliver 11 or 22 volts on the secondary side. Bell ringing transformers take 110 or 220 volts on the primary side and deliver from 6 to 12 volts on the secondary side. The General Electric Co. has found that for 60-cycle work, 12 volts is the most desirable pressure for the secondary. Taking the same primary voltages, the toy operating transformer delivers a much larger number of secondary voltages. In the latter case the secondary voltage can be changed, step by step, until one reaches the maximum voltage this type of transformer is capable of delivering on the secondary side. It is a matter of design in the transformer itself whether these steps are increased one, two, three, or any other number of volts at a time.

Many of these low voltage transformers are so designed that they can be used as combination devices for lighting lamps, ringing door bells, and operating toy or other small motors—all at the same time.

In the table the capacity of each type of transformer is always given in watts. Many dealers and contractors have translated this technical term into trade language, and instead of saying the capacity of a transformer is so many watts, they say it will light so many lamps or ring so many bells. At this point it should be said in passing that the recent development of an efficient lamp of low candle power that will operate on standard lighting circuits, has affected somewhat the manufacture of low voltage lighting transformers.

As already stated, the secondary electrical pressures depend on the design of the transformer, and the connections can be manipulated by the operator so as to make increments or decrements of one or more volts at a time. In all cases, however, these changes in secondary pressures are brought about mechanically either by shifting the wires leading from the current consuming device to the transformer binding posts, or by rotating the handle, with which some of these transformers are equipped, in much the same way as a motor man on the street car rotates the handle of his controller.

These transformers have no moving parts to wear out. The small transformer, like the large one, and also like the induction motor, and the active material in many electrical measuring instruments, owes its usefulness and its simplicity to the inductive effect produced when a coil carrying an alternating current is brought near to a similar coil which is not only not connected with the active coil in any way but is thoroughly insulated to prevent contact with it. In transformers, the active coil; that is, the coil connected to the source of energy, is called the "primary." The coil in which current is produced by induction from the primary, is called the "secondary." All these transformers operate on alternating current circuits only. They will not operate on direct current circuits. The only difference between a transformer and an induction motor is that in the transformer both the primary and the secondary are stationary. Neither one moves. In the induction motor the primary—here called the stator—is, as its name implies, stationary. The secondary—here called the rotor—rotates on a shaft centered in it for that specific purpose.

As will be seen in the table, nearly all of the small transformers are designed to operate on 60 cycle circuits. Some operate on 25 cycles, some on odd frequencies like 40 cycles, others on high frequencies like 133 cycles. Many of them are designed to operate on 60 cycles because 60 cycles is now standard for all alternating lighting circuits. Others operate on 25 cycles because 25 cycles is now standard for alternating power circuits.

The capacity of a transformer is usually measured in watts. The watts are always equal to the product of the pressure in volts by the current in amperes. In every case it will be found that the number of watts on the primary side is the same as the number of watts on the secondary side. In other words, volts × amperes on the primary side equals volts × amperes on the secondary side. It follows, then, that if we have, say, 100 volts on the primary and only 10 volts on the secondary, there will be ten times as much current on the secondary side as on the primary. On the primary we have a comparatively high voltage and low amperage; the secondary, on the contrary, has low voltage and high amperage. This explains why so many different devices may all be operated at the same time from the secondary. The only thing limiting the number of toys, bells, lamps, or other devices that may be operated from the secondary is the capacity of the transformer.

The relationship between primary and secondary voltage and amperage is due simply to the relationship existing between the primary and secondary coils or windings. This is merely a matter of design. In step-down transformers, such as we are considering, the primary consists of a large number of turns of comparatively small sized wire, while the secondary consists of a comparatively small number of turns of large sized wire. The different secondary voltages are obtained simply by tapping the secondary windings at different points. Tapping the secondary at these points is equivalent to changing the ratio between the primary and secondary turns. The new Wayne toy transformer, for instance, is built for three secondary voltages. The ratio of the secondary to the primary winding is such that a normal pressure of 12 volts is obtained from it. This secondary is tapped at a point that represents one-third the total number of turns. This tap is connected to a binding post. It will be easily seen from this that there will be a pressure of 4 volts between the binding post to which the tap is connected and the transformer binding post one-third the number of turns away from it. On the other side there will be a pressure of 8 volts between the tap binding post and the other transformer post. By this means this transformer, which would ordinarily give a secondary pressure of but 12 volts, can now be made to give at will—merely by changing the wires leading to the different binding posts—the three different secondary pressures of 4, 8, and 12 volts. By exactly the same means; that is, by tapping the secondary winding at different points any number of secondary voltages can be obtained.

For those of an inquiring turn of mind and who wish further details concerning the design of these admirable little electrical devices we append the following technical considerations furnished us by an engineer associated with one of the large manufacturing companies.

The bell ringing transformer is core type in design, the primary and secondary windings being separate coils. The primary winding designed for 110 volts is mounted on one leg of the magnetic circuit, while the secondary coil is mounted on the other leg of the magnetic circuit. The purpose of this construction; that is, the primary on one leg and the secondary on the other, is to secure a high reactance. This high reactance is necessary in order to permit the transformer to be short circuited for an indefinite time without injury. This is one of the requirements of the National Board of Fire Underwriters. The secondary winding is built for a total of 24 volts on open circuit, with a tap which gives 8 volts on one side of the tap and 16 volts on the other side of the tap. Thus with a winding of three leads, we obtain open circuit voltages of 8, 16, and 24 volts. On account of the high reactance secured by this construction the regulation of the transformer is relatively poor; and at normal rated current, corresponding to 20 watts, the voltage on the secondary side drops to something like 70 per cent. of the open circuit voltage; that is, the transformer has an approximate regulation of 30 per cent. The high reactance is secured by the wide separation magnetically of the two windings which results in a magnetic leakage between them when the low tension winding is delivering current. In other words, all of the lines of force which encircle the primary winding do not pass through the secondary winding.

The Westinghouse sign lighting transformers are made in two types, the transformer type and the auto-transformer type. In the transformer type the secondary is wound in two parts which are connected in series for 20 volts and in parallel for 10 volts. The primary is a continuous winding, having taps for normal of 110 volts and taps for voltages approximately 10 per cent. above and below this value. These are also made with a primary of 220 volts with taps for 10 per cent. above and below normal. These transformers are shell type design and are made to have as good regulation as possible in order that the proper voltage may be applied to the lamps.

In the auto-transformer type there is a continuous winding which serves for both primary and secondary. The primary is provided with taps for 10 per cent. above and below normal voltage and taps are provided for a 10-volt secondary throughout the entire winding. It is possible to connect up as many as 12 circuits on the 110-volt type. The winding is so designed that it will not be overheated in case six adjacent circuits are loaded to their full capacity. The transformer is rated in secondary amperes, the interpretation of this rating being that lamps may be connected across any circuit taking a total current equal to the rating.

The tungsten economy coils are auto-transformers and are designed along the same line as the auto-transformer for sign lighting service. The type for use on nominal 110-volt circuits have primary taps for 104, 108, 112, 116, and 120 volts, with taps for four secondary circuits of 27 volts each. These are also rated in secondary amperes as explained above. These coils are of shell type design, similar to the sign lighting transformers. The winding is continuous and made of one size of copper throughout.

From a historical point of view it might be interesting to note here that some writers give credit for the invention of the transformer to Ruhmkorff. It is the consensus of opinion, however, that the credit for this invention belongs not to Ruhmkorff but to Faraday. Faraday's original transformer, consisting of an iron ring with two insulated wire windings on it, was the first practical transformer ever made. It embraced all the essential features of the best transformers of to-day.

The Faraday and Ruhmkorff coils are types of the two classes of transformers now in common use—the open circuit transformer and the closed circuit transformer. The Ruhmkorff coil is inherent in all the induction coils used in medical apparatus, gas engine ignition, electric gas lighting, and wireless. The Ruhmkorff coil differs essentially from the Faraday coil in that the latter coil completes its magnetic circuit through metal of low resistance, while the former completes its magnetic circuit through air of high resistance. The Faraday coil is inherent in all transformers—transmission, distribution, and low voltage.

Company	Kind of Transformer	Primary Voltage	Secondary Voltage	Frequency in Cycles	Capacity in Watts	Size in Inches	Weight in Pounds
American Transformer Co., Newark, N. J.	Bell ringing	110–220	11–22	60	250–2000	9¾ x 7½ x 13¼	23–84
Campbell Electric Co., Lynn, Mass.	Sign lighting	110–220	11–22	60	100–3000	....	10–150
Dongan Electric Mfg. Co., Detroit, Mich.	Bell ringing Toy operating Sign lighting	110 110 110–220	6–12–18 7–11–14–17–20–24 6–10	40–60 40–60 40–60	25 150 150–1000	5½ x 4 x 2⅜ 5 x 5 x 4¼	5 7 ....
Edwards & Co., New York, N. Y.	Bell ringing	115	6–12–18	25–60	25	3⅜ x 3⅝ x 7¼	7½
Electric Mfg. Co., Baltimore, Md.	Toy operating	115	1–24	25–60	20–75	6¼ x 5 x 3⅞	7–10
Empire Transformer Co., Chicago, Ill.	Bell ringing Toy operating Signal work	110–220 110 110–220	6 3–6–9–10–16–19 6–14–20	25–60 60 25–60	18 100 35	....	3½ ....
Fort Wayne Electric Works of General Electric Co., Fort Wayne, Ind.	Bell ringing	110	12	60	10	6½ x 3½ x 2½	4½
General Electric Co., Schenectady, N. Y.	Bell ringing	110	8–16–24	60	....	5¾ x 5⅞ x 3¾	8
Goettmann, O. J., Pittsburgh, Pa.	Bell ringing Toy operating Sign lighting	110 110 110	3–5–8–10–12–17 2–6–7–13–15–20–26–29 10–12	60–133 60–133 60	60 100 125–2000	....	9 14½ 15–75
Goldberg Ozone Machine Co., Indianapolis, Ind.	Bell ringing	110	7	60	26	4⅜ x 4⅝ x 2⅛	3½
King Electric & Mfg. Co., Cleveland, Ohio	Bell ringing Toy operating Sign lighting	110–220 110 110	3–7–10–13–17–20 3–7–10–13–17–20–25 12	25–60–133 25–60–133 25–60–133	40–125 40–130 12	3 x 6½ 3½ x 6½ 2½ x 4 x 6	7½ 8¼ 5
Lionel Mfg. Co. New York, N. Y.	Toy operating	110	3–5–6–11–14–15 18–21–23–26–29	60	60	6½ x 5 x 3½	9½
Mohawk Electric Co., Newark, N. J.	Bell ringing Toy operating	110–125 110–125	6 3–6–10–15–20–25	25–60 25–60	60–200 125	3 x 4⅜ 6½ x 6½	3 7
Moloney Electric Co., St. Louis, Mo.	Sign lighting	110–220	11–22	60	150–2000	....	....
Packard Electric Co., Warren, Ohio	Bell ringing	110	6	25–60	3	3¼ x 3½ x 3	1¾
Pittsburgh Transformer Co., Pittsburgh, Pa.	Bell ringing	110–125	4–8–12	25–60	....	6 x 3½ x 2	3½
Rittenhouse Co., A. E., Honeoye Falls, N. Y.	Bell ringing Toy operating	110 110–125	10 3–6–9–12–15–18–21	60 25–60–125	10 150	1¾ x 2½ x 2½	1 ....
Victor Electric Co., Chicago, Ill.	Bell ringing	110–220	6–10–16	25–60	24	4½ x 5 x 2½	3
Viking Electric Co., New York, N. Y.	Bell ringing Toy operating Sign lighting	110 110 110–220	2–8 1.5–36 11–27	60 60 25–133	 50–1500	4¾ x 4¼ x 2⅝	2½ 20–70
Western Transformer Co., East Oakland, Cal.	Bell ringing Toy operating	110–220 110–220	6–12 2.5–24	60 60	....	3 x 4 x 2½	3½ 11
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.	Bell ringing Indoor tungsten lighting Outdoor sign lighting	110 110–220 110–220	8–16–24 27 12 circuits, 10 volts each	60 60 60	20 135–810 50–250	4¾ x 3½ x 2⅞ 7⅞ x 5⅝ x 4⅝ 9¾ x 6¾ x 3¾	3¾ 16 22½

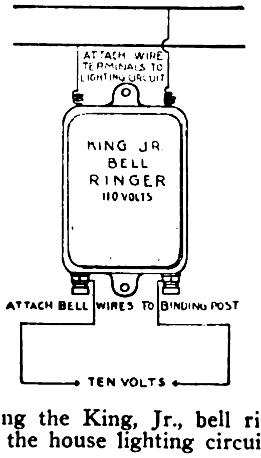
Type A bell ringing transformer. Made by Victor Electric Co., Jackson boulevard and Robey street, Chicago. Primary, 110-220 volts. Secondary, 6 volts. Cycles, 25-60. Single phase. Capacity, 9 watts

Wayne bell ringing transformers. Made by Fort Wayne Electric Works of General Electric Co., Fort Wayne, Ind. Primary, 110 volts. Secondary, 12 volts. Cycles, 60. Single phase. Capacity, 10 watts

Empire No. 2 bell ringing transformer. Made by Empire Transformer Co., 2723 North Clark street, Chicago, Ill. Primary, 110-220 volts. Secondary, 6-14-20 volts. Single phase. Cycles, 25-60. Capacity, 35 watts

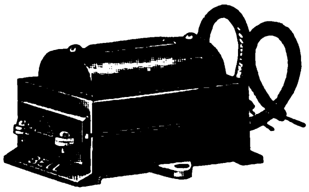
Transformer for operating door openers, ringing bells and buzzers. Made by The Packard Electric Co., Warren, Ohio. Primary, 110 volts. Secondary, 6 volts. Cycles, 25-60. Single phase. Capacity 9 watts on short circuit

King Type C bell ringing transformer. Made by King Electric & Mfg. Co., Cleveland, Ohio. Primary, 110 volts. Secondary, 12 volts. Cycles, 25-60-133. Single phase. Capacity, 12 watts

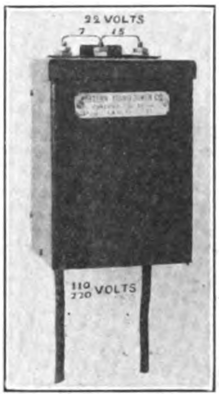

ATTACH WIRE TERMINALS TO LIGHTING CIRCUIT
KING JR BELL RINGER 110 VOLTS
ATTACH BELL WIRES TO BINDING POST
TEN VOLTS

Method of connecting the King, Jr., bell ringing transformer into the house lighting circuit

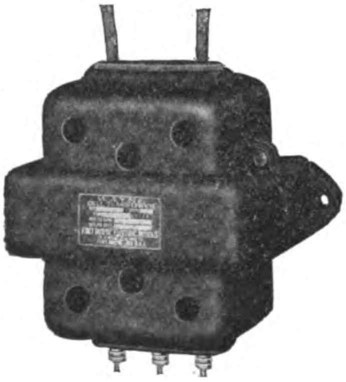
King, Jr., bell ringing transformer. Made by King Electric & Mfg. Co., Cleveland, Ohio. Primary, 110 volts. Secondary, 10 volts. Cycles, 25-60-133. Single phase. Capacity, 6 watts



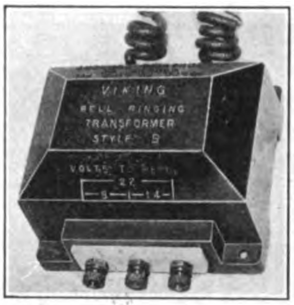
Dixie type bell ringing transformer. Made by Edwards & Co., 140th and Exterior streets, New York. Primary, 115 volts. Secondary, 8 volts. Cycles, 25-60. Capacity, 25 watts.



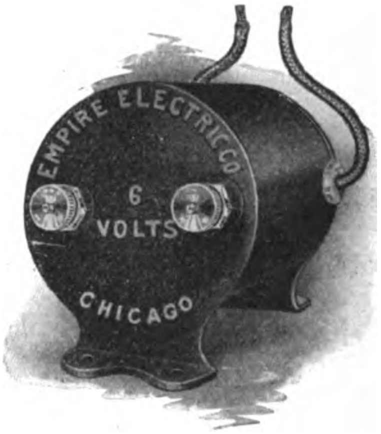
Combination bell ringing and gas range lighting transformer. Made by Western Transformer Co., East Oakland, Calif. Primary, 110-220 volts. Secondary, 7-15-22 volts. Cycles, 25-60



Wayne bell ringing transformer. Made by Fort Wayne Electric Works of General Electric Co., Fort Wayne, Ind. Primary, 110 volts. Secondary, 8-16-24 volts. Cycles, 60. Capacity, five 5 to 7 inch bells, or ten 2 to 4 inch bells simultaneously, the bells being connected in multiple across the secondary circuit

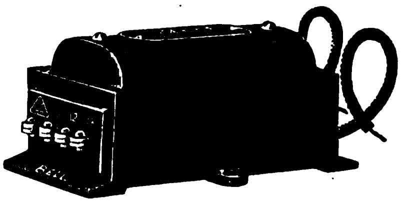


Bell ringing transformer. Made by Viking Electric Co., 150 Chambers street, New York. Primary, 110 volts. Secondary, 8-14-22 volts. Cycles, 25-60



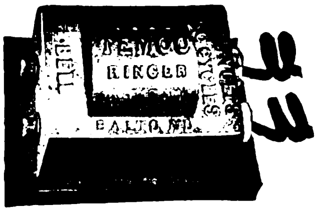
Bell ringing transformer. Made by Empire Transformer Co., 2723 N. Clark street, Chicago, Ill.

Bell transformer No. 1-A. Primary, 110 volts. Secondary, 2-4-8-10-12 volts. Cycles, 60 or 125. Capacity, 8 watts. Made by Vindex Electric Co., Aurora, Ill.



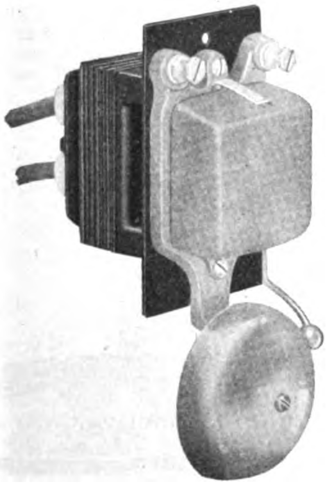
Cadet type bell ringing transformer. Made by Edwards & Co., 140th and Exterior streets, New York. Primary, 115 volts. Secondary, 6-12-18 volts. Cycles, 25-60. Capacity, 25 watts

Wayne bell ringing transformer. Made by Fort Wayne Electric Works of General Electric Co., Fort Wayne, Ind. Primary, 110 volts. Secondary, 12 volts. Cycles, 60. Capacity, three 3-inch bells at the same time when connected in multiple

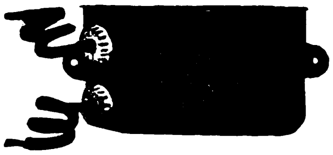


Type A "Temco" bell ringing transformer. Made by The Electric Mfg. Co., 2046 Harlem avenue, Baltimore, Md. Primary, 100-125 volts. Secondary, 8 volts. Cycles, 60. Capacity, 20 watts

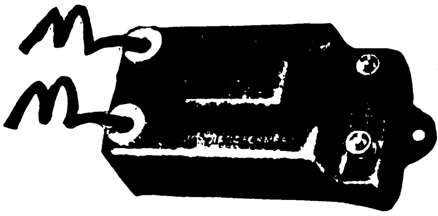
King Type A bell ringing transformer. Made by King Electric & Mfg. Co., Cleveland, Ohio. Primary, 110-220 volts. Secondary, 3-7-10-13-17-20 volts. Cycles, 25-60-133. Single phase. Capacity, 40 watts



Bell ringing and "Nite Lite" transformer. Made by The A. E. Rittenhouse Co., Honeoye Falls, N. Y. Primary, 110 volts. Secondary, 10 volts. Cycles, 60. Single phase. Capacity, 10 watts



Bell ringing transformer. Made by Thordarson Electric Co., 511 South Jefferson street, Chicago, Ill.

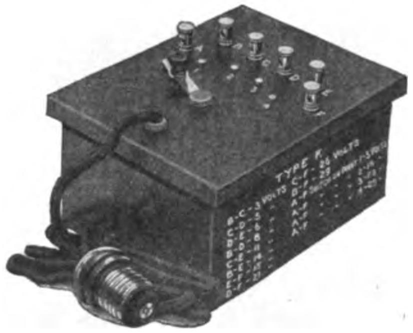


Bell ringing transformer. Made by Liebel Mfg. Co., 1002 Hill street, Cincinnati, Ohio

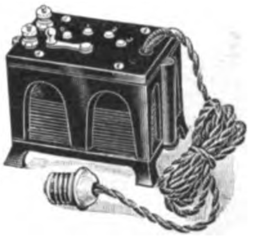
Fused toy transformer. Type F. Capacity, 120 watts. Primary voltage, 110 volts. Secondary, 7-11-14-17-20-24 volts. Equipped with low voltage fuse, and of the lever control design. The fuse is a new feature, being introduced by the Dongan Electric Mfg. Co. on their Master and Type F toy transformers

Transformer for operating bells, buzzers, annunciators, burglar alarms, and toys. Made by Pittsburgh Transformer Co., Pittsburgh, Pa. Primary, 100-125 volts. Secondary, 4-8-12 volts. Cycles, 25-60

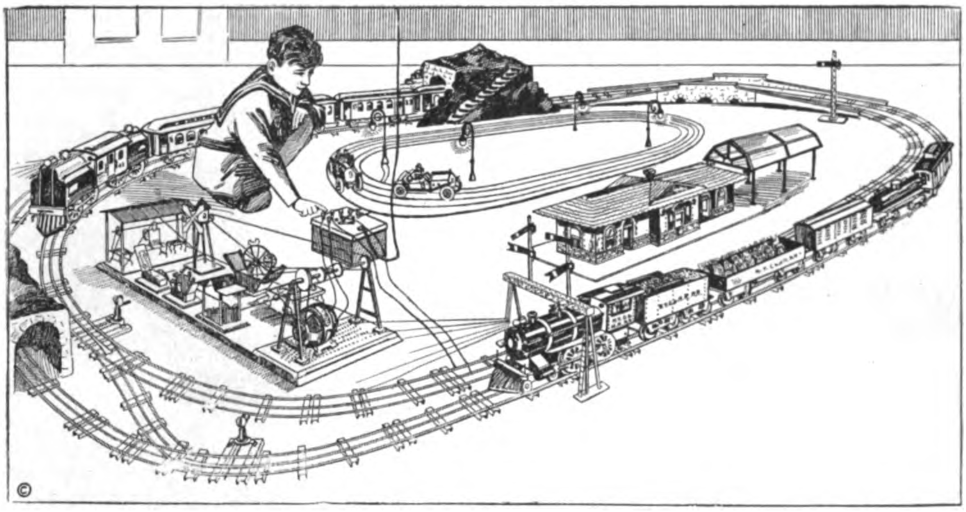
King Type B toy operating transformer. Made by King Electric & Mfg. Co., Cleveland, Ohio. Primary, 110 volts. Secondary, 3-7-10-13-17-20 volts. Cycles, 25-60-133. Single phase. Capacity, 40 watts



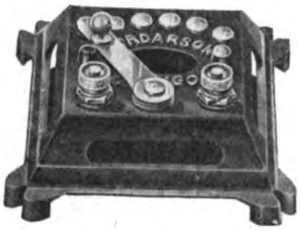
Toy operating transformer. Made by Lionel Mfg. Co., 48 East 21st street, New York. Primary, 110 volts. Secondary, 3-29 volts. Cycles, 60. Capacity, 60 watts



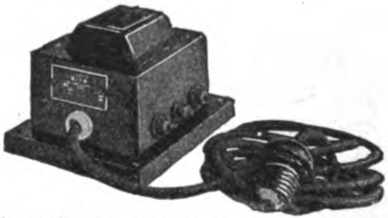
Type XX toy operating transformer. Made by Viking **Electric** Co., 150 Chambers street, New York. Primary, **110 volts.** Secondary, 4½-11¼ volts. Cycles, 60



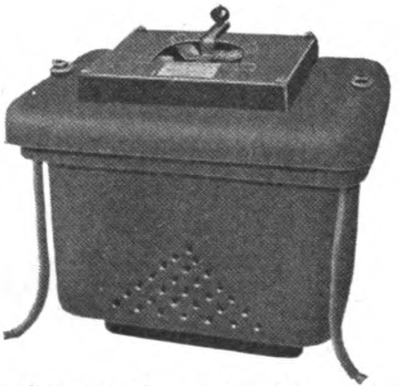
Low voltage, toy operating transformer. Made by Lionel Mfg. Co., 48 East 21st street, New York. Primary, 110 volts. Secondary, 3-5-6-11-14-15-18-21-23-26-29 volts. Cycles, 60. Capacity, 60 watts



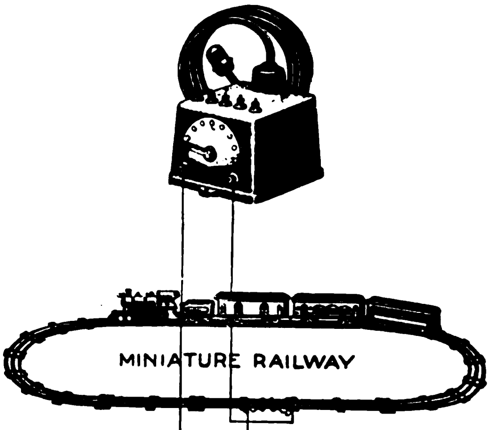
Toy operating transformer. Made by Thordarson Electric Mfg. Co., 511 South Jefferson street, Chicago, Ill.



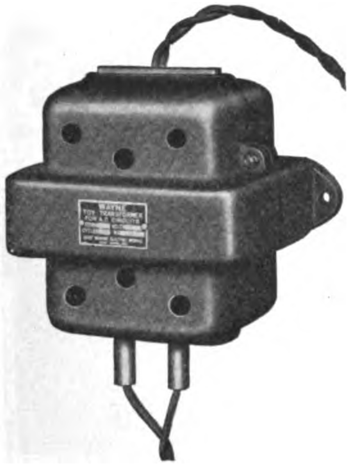
Type C-1 "Temco" toy transformer. Made by The Electric Mfg. Co., 2046 Harlem avenue, Baltimore, Md. Primary, 100-125 volts. Secondary, 1-24 volts. Single phase. Cycles, 25-60. Capacity, 40 watts



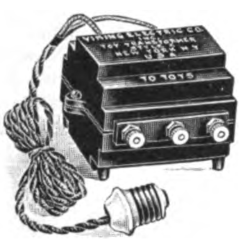
Type H low voltage transformer for either indoor or outdoor use, 250-3000 watts capacity. Primary, 110-220 volts. Secondary, 11-22, 14-28, 28-56 volts. Cycles, 60 or 133. Made by Vindex Electric Co., Aurora, Ill.



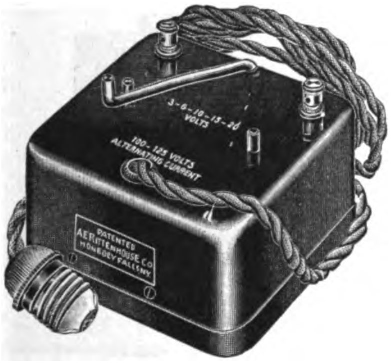
Toy operating transformer. Made by O. J. Goettmann, 55 Ohio street, East, N. S., Pittsburgh, Pa. Primary, 110 volts. Secondary, 11-13-15-17-19 volts. Cycles, 25-60-133. Capacity, 65 watts



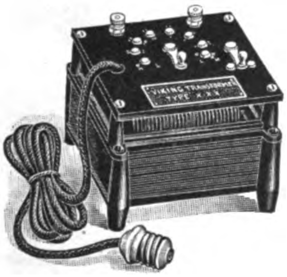
Wayne toy operating transformer. Made by Fort Wayne Electric Works of General Electric Co., Fort Wayne, Ind.



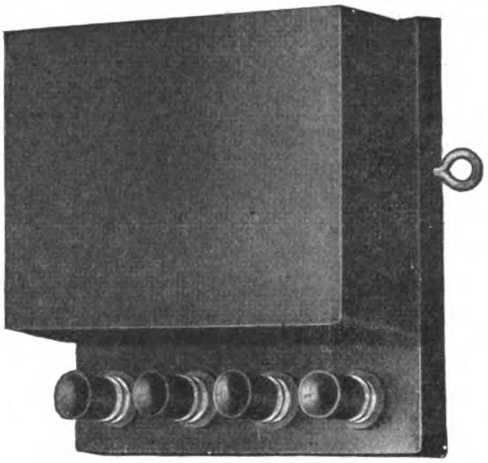
Type X toy operating transformer. Made by Viking Electric Co., 150 Chambers street, New York. Primary, 110 volts. Secondary, 5-7.6 volts. Cycles, 60


3-6-10-15-20 VOLTS
100-125 VOLTS ALTERNATING CURRENT
PATENTED A.E. RITTENHOUSE CO. HONEOYE FALLS, N.Y.

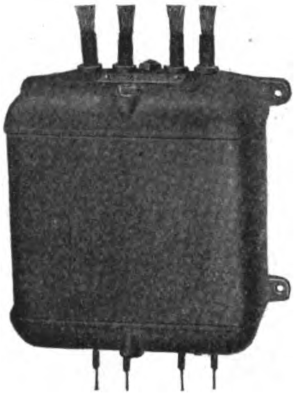
Toy operating transformer. Made by The A. E. Rittenhouse Co., Honeoye Falls, N. Y. Primary, 100-125 volts. Secondary, 3-6-9-12-15-18-21 volts. Cycles, 25-60-125. Capacity, 150 watts



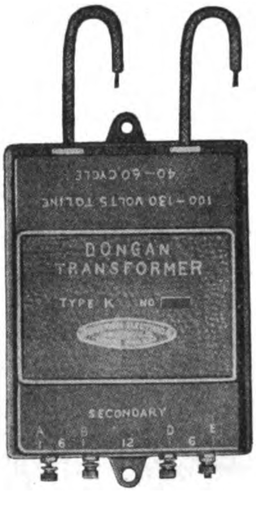
Type XXX toy operating transformer. Made by Viking Electric Co., 150 Chambers street, New York. Primary, 110 volts. Secondary, 1.5-36 volts. Cycles, 60



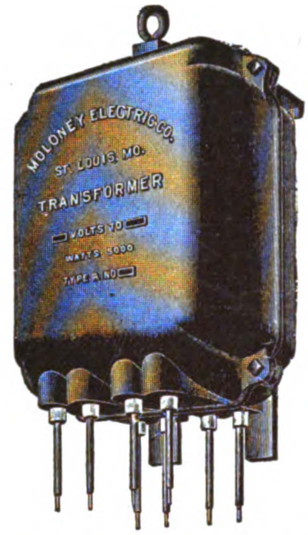
Bell ringing transformer. Made by Goldberg Ozone Machine Co., 800 Ft. Wayne avenue, Indianapolis, Ind. Primary, 110 volts. Secondary, 7 volts. Cycles, 60. Capacity, 26 watts on secondary with primary short circuited



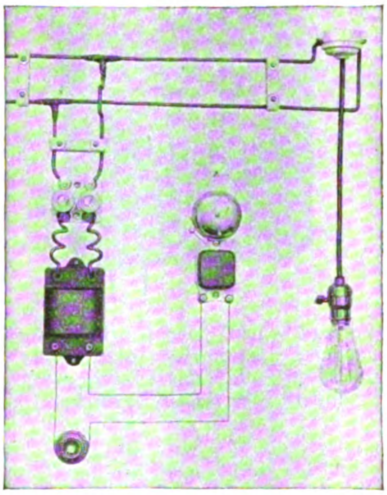
Type G low voltage transformer for indoor use only, 150 to 750 watts capacity. Primary, 110-220 volts. Secondary, 11-22, 14-28, 28-56 volts. Cycles, 60 or 133. Made by Vindex Electric Co., Aurora, Ill.



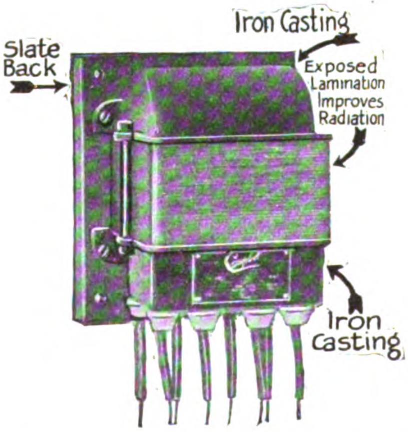
Heavy duty transformer. To operate large transformer bells, and installations where a heavier duty transformer than the ordinary bell type is required. Type P, 60 watts capacity, 110 or 220 volts primary, 6-12-18 volts secondary. Type K, 75 watts capacity, 110 or 220 volts primary, 6-12-18-24 volts secondary. Made by Dongan Electric Mfg. Co., Detroit, Mich.



Type DA Moloney sign lighting transformer. Made by Moloney Electric Co., St. Louis, Mo. Primary, 110-220 volts. Secondary, 11-22 volts. Cycles, 60. Capacity, 2000-7500 watts

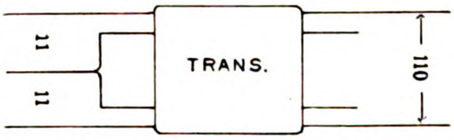


Wayne bell ringing transformer connected for service

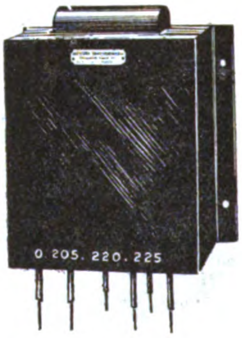


Low voltage sign transformer. Made by Campbell Electric Co., Lynn, Mass. Primary, 110-220 volts. Secondary, 11-22 volts. Cycles, 60. Capacity, 100-3000 watts

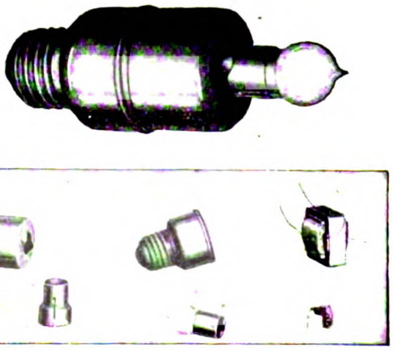
Double wound sign lighting transformer. Made by American Transformer Co., 143 Miller street, Newark, N. J. Primary, 110-220 volts. Secondary, 11-22 volts. Cycles, 60. Single phase. Capacity, 250-2000 watts



Three-wire secondary used with low voltage transformers. Made by Vindex Electric Co., Aurora, Ill.

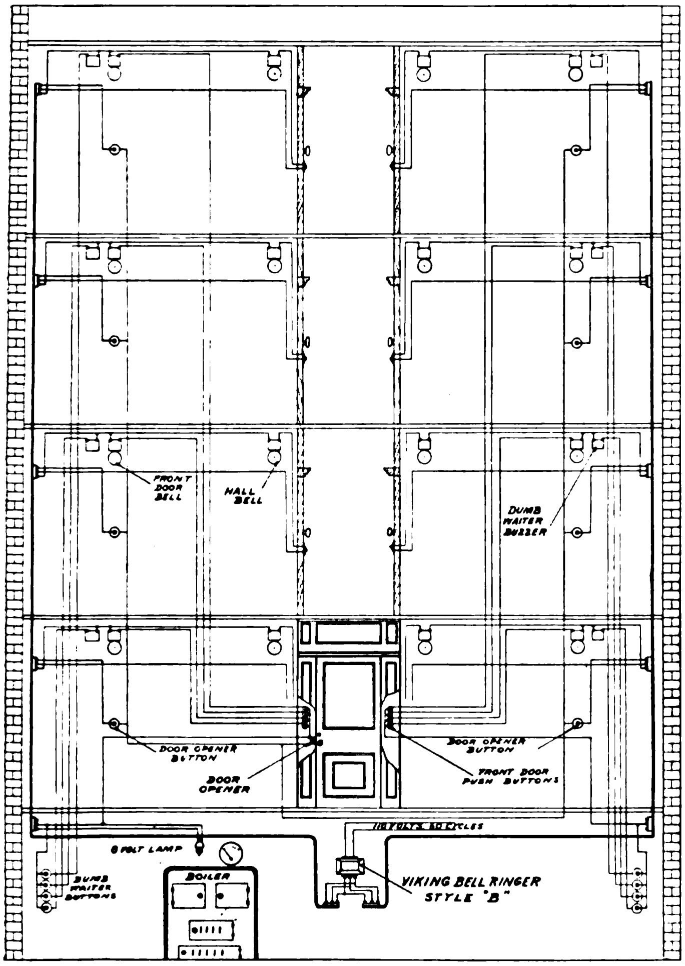


House lighting and sign transformer. Made by Western Transformer Co., East Oakland, Calif. Primary, 110-220 volts. Secondary, 11-22 volts. Cycles, 60, single phase. Capacity, 125-10,000 watts

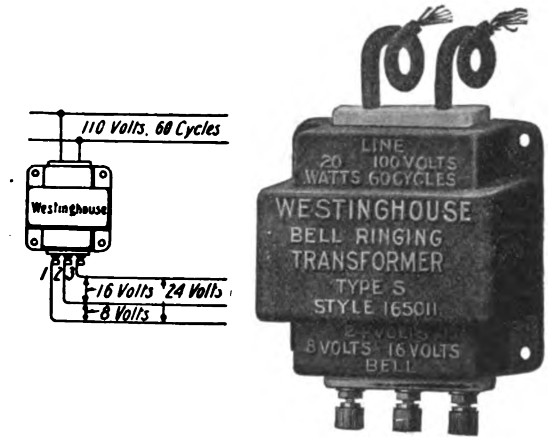


Nite Lite” transformer lamp. Made by General Electric Co., Schenectady, N. Y. Primary, 100-125 volts. Secondary, 6 volts. Cycles, 50-140. Capacity, one 2 c.p. mazda lamp

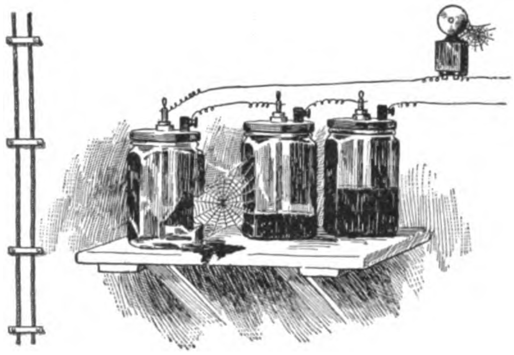
Low voltage illuminated house number. Equipped with a 6-volt 2-candle power lamp, operated from Dongan Type S bell ringing transformer. Current consumption less than 3 watts. Transformer can also be used for door bells, etc. Made by Dongan Electric Mfg. Co., Detroit, Mich.



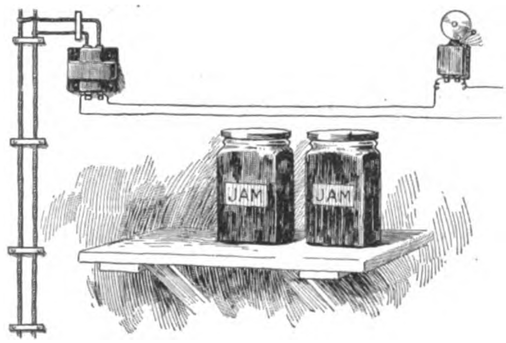
Modern wiring installation in an 8-apartment dwelling house. Installation consists of eight 2½-inch hall bells, eight front door bells, eight dumb waiter buzzers, one door opener, one 8-volt Mazda lamp in basement. Rizers about 300 feet No. 14 wire. Branch circuits, about 750 feet No. 18 wire. A Viking new type B bell ringing transformer is shown connected in for operating this installation. Transformer made by Viking Electric Co., 150 Chambers street, New York



Bell ringing transformer, and method of connecting it. Primary, 110 volts. Secondary, 8-16-24 volts. Cycles, 60. Capacity, 20 watts. Made by Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.



This is the way the cellar looked in the days when bells were rung by battery current



This is how the cellar looks today, with Westinghouse transformer energizing the bells

Type D Moloney sign lighting transformer. Made by Moloney Electric Co., St. Louis, Mo. Primary, 110-220 volts. Secondary, 11-22 volts. Cycles, 60. Capacity, 150-2,000 watts

COMMON MATERIALS

SUCH AS ARE USED IN MANUFACTURING AND INSTALLING SPECIAL DEVICES. ALL NEW PRODUCTS ARE SHOWN IN THE DEPARTMENT SO NAMED.

No. 31—Small Springs

While it is generally understood that by the word "spring" is meant a strip of wire coiled or wound and designed to withstand a stress, it should be observed that any piece of tempered steel designed to resist a push, pull, or twist is also a spring. If springs are made of round or flat wire and coiled, they are called spiral springs by the trade. Properly called, they are helical springs. If made of flat strips of metal and punched or formed to shape they are known as flat springs.

In the mechanical and electrical trades springs are called either small or large. Such distinction, however, is meaningless, as a spring made of half inch wire, two inches in diameter when coiled, and six inches long, is called by one manufacturer a small spring. Another would call it a large spring. Manufacturers of springs do not confine themselves to certain sizes of springs. The sizes are regulated by their machine equipment. Some make springs up to two inches in diameter; others make them up to four inches in diameter. Both say they make small springs. The only distinction seems to be one, not of size, but of the method of making. Any spring capable of being made or coiled "cold" is commonly called a small spring; one that has to be made or coiled "hot" is called a large spring. Spring manufacturers listed as small spring makers coil their springs "cold."

Manufacturers of small springs divide springs into two distinct classes: spiral or helical springs, and flat springs.

SPIRAL OR HELICAL SPRINGS

There are three kinds of helically wound springs. They are known as extension, compression, and torsion springs.

An extension spring is one in which the wire is close wound and is used when a "pull" is required.

A compression spring is one in which the wire is open wound and is used when the spring is pushed or compressed.

A torsion spring is one which of itself has no "spring." In order to serve as a spring it has to be twisted; as, for instance, a screen door hinge spring.

Helically wound springs are essentially wire springs and are made of round, square, flat, and music iron wire; also of brass, phosphor bronze, German silver, and carbon and vanadium steel wire. They are furnished in any size of wire, in any length, and of any diameter within the limits of the machines of the manufacturer. The coils in these helical springs are made running from left to right or from right to left, according to requirements. Unless otherwise requested these springs are furnished with a blue finish. They will be japanned or finished in any other style desired.

Extension springs are furnished regularly with the following styles of loops and hooks on ends: half loop closed, half loop open, full loop, short loop, whole coil in center, whole coil at side, long loop, long eye, eye in center, eye at side, double loop, tapered end with bolt, plain end, and tapered end with swivel hook.

Compression springs are furnished with the following styles of ends; flatted, flatted and ground, and plain cutoff.

In ordering springs it is best to send the manufacturers a sample of the spring wanted, or a sketch showing it. In sending information regarding diameters and other dimensions, manufacturers particularly request that decimals be used rather than gauges, for the reason that there are four gauges in common use and unless a specific gauge is mentioned much confusion will result.

If a sample or sketch of the spring desired cannot be sent it is best first to write to the manufacturers requesting their catalogues. In these catalogues will be found a large number of rules regarding spring design, knowledge of which a customer should have if ordering springs when the size and other characteristics have to be determined. This information of use to the buyer and found in the spring makers' catalogues has to do with diameter, tension, tensile strength, positions of loop or hooks, load to be carried, length under load and free length, span, pitch, or spacing of coils, capacities, and so on.

FLAT SPRINGS

Flat springs, as mentioned in the beginning of this article, include flat strips of metal punched and formed to shape that are designed to withstand pressure. The shapes and designs of these flat springs are too varied to classify. They are usually made from steel oil tempered and tumbled bright, from phosphor bronze, or from brass.

In this class of flat springs also belongs the true spiral spring, called motor or clock spring. This spring is not for use in connection with motors, but to take the place of a motor, to actuate such devices as talking machines. Then there are very small, fine spiral springs, essentially flat springs but called hair springs, on account of their fineness and similarity to hair. These hair springs are used almost exclusively in meters and instruments in the electrical trade. When the spring is not required to carry current it is made of phosphor bronze. When current is carried by the spring, as is the case in delicate instruments requiring very sensitive mechanism, it is either made of a special alloy or of sterling silver.

SOME ELECTRICAL USES FOR SPRINGS

It is not feasible to make positive statements as to the specific electrical uses of each class or kind of spring. In some places a flat spring is used, in another place a spiral or helically wound spring is used. Many years ago spring manufacturers and other interested concerns attempted to classify and standardize springs and their uses, but without satisfactory result.

It is known, however, that springs, both spiral and helically wound and flat springs, are used in connection with the following electrical devices:

Brushes
Chandeliers
Fire alarms
Heating appliances
Instruments
Magnetos
Meters
Motors
Push buttons
Rheostats
Sign flashers
Sockets
Switchboards
Switches
Telephones
Wireless sets

Necessarily this list is not complete, as it might be safely said that almost every electrical device has a spring of some sort used in making it.

MANUFACTURERS OF SPRINGS

The following companies make small springs, or, as previously stated, springs that are made or coiled "cold":

A. B. C. Spring Co., New York.
American Spiral Spring & Mfg. Co., Pittsburgh, Pa.
American Steel & Wire Co., Chicago, Ill.
Wallace Barnes Co., Bristol, Conn.
Cary Spring Works, New York.
Chase-Duniplace Co., Toledo, Ohio.
Cook Spring Co., New York.
Cuyahoga Spring Co., Cleveland, Ohio.
Detroit Wire Spring Co., Detroit, Mich.
Dunbar Bros. Co., Bristol, Conn.
Farrington & Co., Mt. Vernon, N. Y.
Fort Pitt Spring & Mfg. Co., Pittsburgh, Pa.
Wm. D. Gibson Co., Chicago, Ill.
George A. Hebb, Newark, N. J.
Hubbard Spring Co., Pontiac, Mich.
F. N. Manross & Sons, Forestville, Conn. (hair springs only).
Miller Wire Spring Co., Bridgeport, Conn.
Miller & Van Winkle, Brooklyn, N. Y.
Morgan Spring Co., Worcester, Mass.
Peck & Young Mfg. Co., Forestville, Conn.
Raymond Mfg. Co., Corry, Pa.
Union Spring & Mfg. Co., New Kensington, Pa.
Whitnall Co., Plainville, Conn.

Use of Condensers With Metal Filament Lamps

Owing to the low resistance of a cold filament, the initial current is occasionally as much as ten times the normal current of the lamps and this accounts for the fact that metal filament lamps when they are going to break, nearly always do so at the moment of switching on. This initial heavy rush of current is prevented by the use of a condenser, because the normal current cannot under any circumstances be exceeded by more than about 10%. This leads to another important advantage. Owing to the current limit the condenser is valuable in determining the maximum current that can be taken from the circuit, it evidently prevents any danger from short circuiting, or fusing of flexibles, lamp holders, wall plugs and the like. In order to use a low voltage lamp on a high voltage alternating current circuit a condenser of suitable capacity is connected in series with the lamp. This acts as a resistance in absorbing the excess voltage, but whereas an ohmic resistance consumes power, the condenser absorbs voltage without appreciable loss.

Two ways of applying the condensers to metal filament lamp circuits may be discussed. The first is the parallel system in which all the circuits are in parallel, each circuit consisting of a lamp and condenser in series. The second or series system is arranged so that a number of lamps of low voltage are connected in series with each other and a condenser, the individual lamps being controlled by short circuiting switches. The former system is extremely simple and is easily applied to houses which are already wired and can be adopted on single lamps or groups of lamps as may be convenient. Lamps not arranged for control by a condenser can be left to run at their original voltage. In this way the system can be applied to those points where the greatest saving can be effected without interfering with other parts of the house supply. Low candlepower lamps may be installed when these are sufficient, while low candlepower lamps with full pressure of supply can be retained. The wiring is only very slightly disturbed, as the condenser can be fixed under the floor, above the ceiling, or on the wall near the switch. In small sizes the cylindrical type can be used with an adaptor and lamp holder, permitting the insertion of the condenser between any lamp and its original holder.

In the series system on the other hand the short circuiting arrangement of switches is effected either by means of ordinary wall switches or switch lamp holders. So long as the sum of the voltages of the lamps in use at any one time does not exceed 40% of the supply voltage, each lamp practically gets its correct current however many lamps are switched on. The condenser should of course be placed as close as possible to the supply company's fuse, and this series system is especially applicable to cases where there are a number of lamps on a single fitting. Generally the cost of a condenser is not much more than the saving effected in the first cost, due to the use of low voltage lamps. The lamps in series may be of any candlepower, the higher candlepowers being obtained by using higher voltage lamps, care being taken to keep the same rated current.

When condensers are used for power factor improvement, if there is a varying condition of the load, it is advisable to arrange the condensers in sections, each capable of isolation to enable compensation for lagging currents to be adjusted with the varying conditions of the load. For three phase systems the condensers are arranged in three separate cases, and for power work they are manufactured in units of one microfarad to work continuously at a pressure up to 500 volts alternating. These units are hermetically sealed in strong metal cases about 2 in. by 2 in. by 5 in., and provided with screw terminals with cable lugs. Each unit is stressed at 2,000 volts alternating, the insulation at 60 degrees Fah. exceeds 2,000 megohms after one minute's electrification and the capacity is correct to within 5%. In making up large capacities for a working pressure up to 550 volts, these units are connected together in parallel. For circuits of higher voltage than 550, the units are connected in series so that each is working at a voltage not exceeding 550, while groups of these are arranged in parallel to give the desired capacity. It will be seen that there is a distinct sphere for the use of such apparatus and this practical development of the phenomena of electrostatic capacity which has been well known for so many years, will be watched with considerable interest.

SPECIAL DEVICES

SHOWING ALL TYPES WITHOUT REGARD TO TIME THEY HAVE BEEN ON THE MARKET. ALL NEW PRODUCTS ARE SHOWN IN DEPARTMENT SO NAMED.

No. 25---Rheostats

Any device by means of which a variable or adjustable resistance may be introduced in a circuit to regulate the strength of the current, is a rheostat. All devices, however, that are rheostatic in principle, that is, that change the strength of a current by means of a resistance, are not called rheostats.

In this installment of the article those devices catalogued and listed by the makers as rheostats are described and illustrated. In a second and third installment those essentially rheostats, but designated by other names will be described and illustrated.

Rheostats not designed for a particular class of service are generally called field rheostats, due to the fact that they operate to change the strength of the field current. Those that are designed for a particular service are given names descriptive of the service performed, such as: motor starting rheostats, battery charging rheostats, and load or meter testing, and photometer rheostats.

FIELD RHEOSTATS

By field rheostat, is generally meant a rheostat for controlling the fields of generators, rotary converters, and exciters, and for controlling the speed of motors by varying the field strength. These field rheostats are often used as well for charging storage batteries, and for use with low voltage self-exciting plating generators.

Field rheostats are furnished for both alternating and direct current circuits, and for pressures from 75 volts up to over 750 volts.

There are two common types of field rheostats: grid and plate type, made up of grids or plates containing the resistance; tube and unit type, in which the resistance element is wound around a tube or core, and containing any number of resistors required.

The grid and plate type of field rheostat is intended for switchboard mounting, and is furnished for front of board mounting and rear of board mounting. That for rear of board mounting is furnished with a handwheel and dial plate to permit of its operation from the front of the board. It may be remotely controlled and operated by chain and sprocket drive, bevel gear drive, or electric drive.

For generator use the rheostat resistance is generally equal to the field resistance, although furnished with resistances 1½, 2⅓, and 4 times the field resistance when necessary.

The different designs, types of mountings, methods of operating, and general appearances of the various makes of field rheostats can best be explained by pictures. These follow, the caption under each cut explaining the nature of the rheostat, its method of mounting, and its operation.

MOTOR STARTING RHEOSTATS

As the name implies, motor starting rheostats are those designed for starting a motor from rest and accelerating it to full speed, usually by field regulation. Sometimes, however, the rheostat is also designed for starting the motor and regulating its speed. Another type brings the motor from rest to full speed in either direction of rotation.

There are two great classes of motor starting rheostats, one class for direct current motors, the other for alternating current motors. These classes may be subdivided into kinds of each class almost endlessly. For instance, they are sometimes listed according to the type of motor for which designed, method of operation, or function, and given such names as: starting rheostats, motor starting rheostats, motor starting boxes, motor starters, self-starters or automatic motor starters, starting and speed regulating rheostats, reversing motor starters, secondary resistance starters, multiple switch starters, single phase, two phase, and polyphase starters, and squirrel cage motor starters. With other devices mounted on the same panel, such as fuses and switches, they are called starting panels.

The direct current types of motor starting rheostats are usually designed for starting either series, shunt, or compound wound motors. They are generally provided with a low voltage release and a device to prevent arcing. Where necessary, they are furnished with an overload release at additional cost. Some types are hand operated, others (called self-starters) are operated automatically. A few types are also furnished with a short circuiting device to short circuit the series field of a compound wound motor when accelerated to full speed. Others are provided with a device to enable the operator to stop the motor instantly from any desired place by the operation of a push button. Many of the types of direct current motor starters are illustrated, the caption under each cut explaining the nature and use of the rheostat shown.

Alternating current motor starting rheostats may be subdivided into two kinds: single phase, and two phase or polyphase, motor starting rheostats.

Single phase motor starting rheostats are used to meet the requirements of the commutator types of single phase motors requiring a starting device of larger capacity than that required for direct current motors of the same voltage and horsepower rating, and allowance must also be made for overload conditions.

Two phase and polyphase motor starting rheostats are generally used for starting two or three phase squirrel cage motors that do not have to start under full load conditions. The illustrations show what these starters look like, the caption under each cut telling briefly for what class of motor the starter shown is designed, and its method of operation.

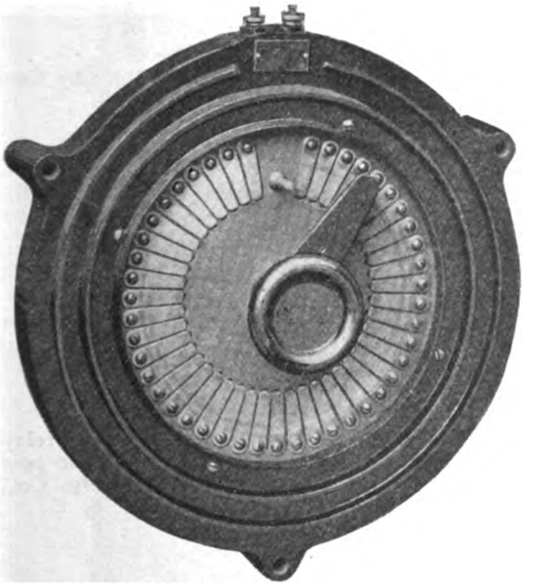
BATTERY CHARGING RHEOSTATS

Battery charging rheostats are those designed especially for charging batteries at any specified maximum rate to a low minimum rate. That is, they usually operate to charge the battery at the specified maximum rate until nearly fully charged, and then at a minimum rate until the battery attains its maximum charge. There are two kinds of these rheostats, those for lead cells and those for Edison cells. Rheostats for Edison cells must have a greater capacity than those designed for use with lead plate batteries. These battery charging rheostats are furnished in many types and styles, and as a rule, are for use on voltages of 115 volts or less. If for use on over 115 volts a special rheostat is generally necessary. The various types are designed for private and public garage use. Illustrations of a number of types and styles are shown, the caption under each cut giving brief information regarding the capacity and function of the rheostat shown. A type of rheostat is also made for controlling the discharge of cells at any desired rate.

LOAD OR METER TESTING AND PHOTOMETER RHEOSTATS

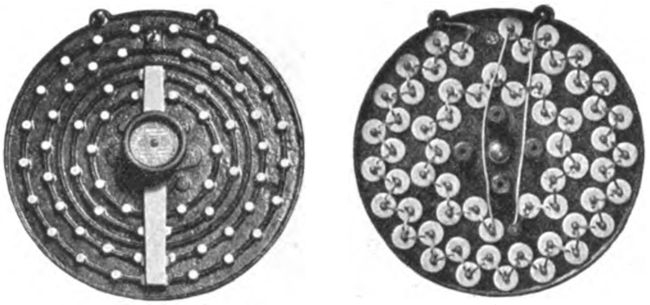
Load or meter testing rheostats are those designed especially for providing an artificial load in connection with the testing of watthour meters, and may be used for either alternating or direct current types of meters. Sometimes they are called laboratory rheostats and are often used for testing out generators.

Photometer rheostats are those designed for use in connection with the testing and manufacture of incandescent lamps. They are sometimes called lamp testing rheostats. One type of this class of rheostat is used in the process of the "flashing" of lamps. Another type is used to maintain an exact and constant voltage on a lamp while testing it. A few types of this class of rheostat are illustrated, the caption under each cut explaining the nature of the rheostat and the work for which it is intended.

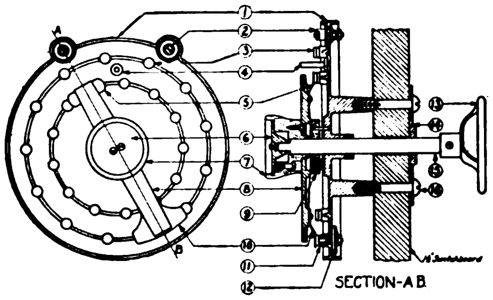


Single plate field rheostat for front of board mounting, in three sizes, 9, 13, and 15 inch plates, for direct and alternating current. Made by Union Electric Mfg. Co., 499 Broadway, Milwaukee, Wis.

Plate type field rheostats for mounting on front of switchboard panel. Made by General Electric Co., Schenectady, N. Y.



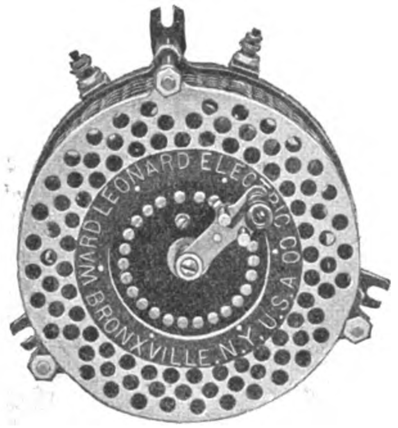
Front view Rear view



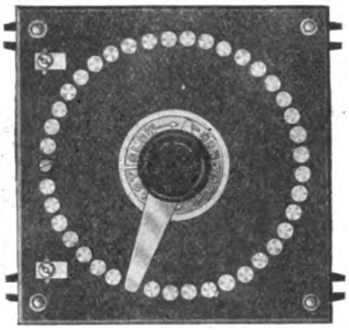
Sectional view

1. Rheostat plate
2. Binding post
3. Contact button
4. Stop post
5. Contact shoe (inner)
6. Name plate
7. Wood knob
8. Lever arm
9. Tension spacer
10. Contact shoe (outer)
11. Lava bushing
12. Resistance unit
13. Hand-wheel
14. Dial plate
15. Shaft
16. Mounting screw

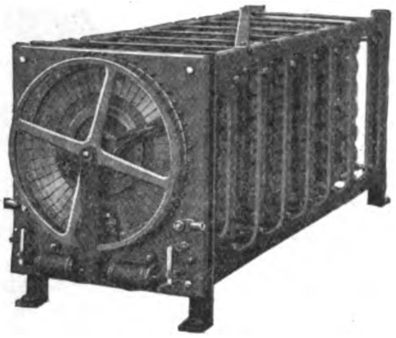
Showing the construction of a front of board type field rheostat. Made by Simplex Electric Heating Co., Cambridge, Mass.



Motor field rheostat for use in controlling the speed of a motor by varying its field strength. Made by Ward Leonard Electric Co., Bronxville, N. Y.



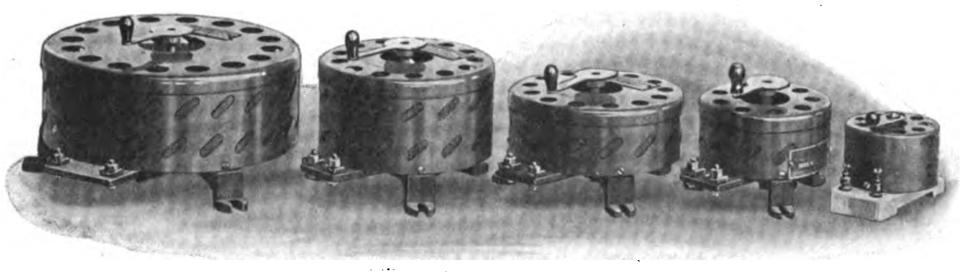
40-step motor field rheostat for adjustable speed, d. c. motors up to 30 horse power. Made by The Electric Controller & Mfg. Co., 79th street and Woodland avenue, S. E., Cleveland, Ohio



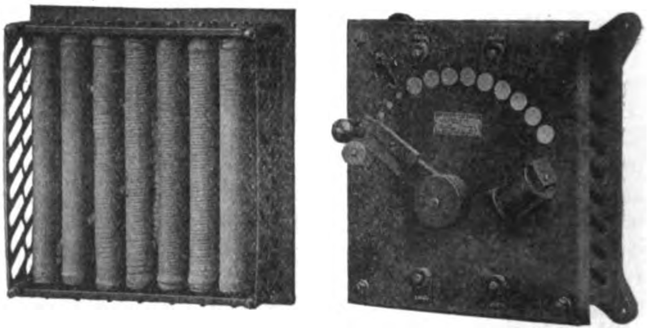
Grid type, field rheostat with electrically operated switch, designed for remote control of rheostats with maximum capacities of from 25 to 300 amperes. Made by General Electric Co., Schenectady, N. Y.

Remote control field rheostat for railway generators and rotary converters, designed for remote control by sprocket drive. Made by Ward Leonard Electric Co., Bronxville, N. Y.

Electrically operated, tube type, field rheostat. Made by General Electric Co., Schenectady, N. Y.

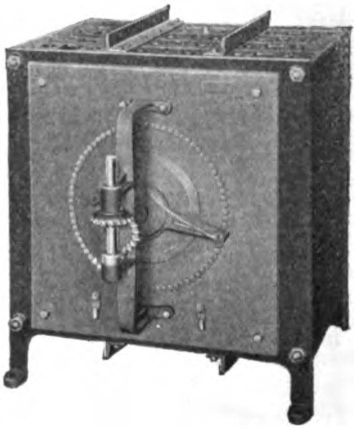


Round type of field rheostats. Illustration shows five of the twenty different sizes of this type of rheostat made by National Electric Controller Co., 1110-1112 West Lake street, Chicago, Ill. This type also used as armature speed regulators, battery charging rheostats and motor field rheostats



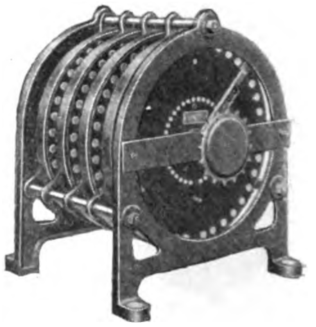
Rear view Front view

Motor starting rheostat for use in mines and other places where the apparatus is subjected to dampness, for starting d. c. motors up to 15 horsepower. Equipped with low voltage release and arcing tip or blowout and overload release when desired. Made by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

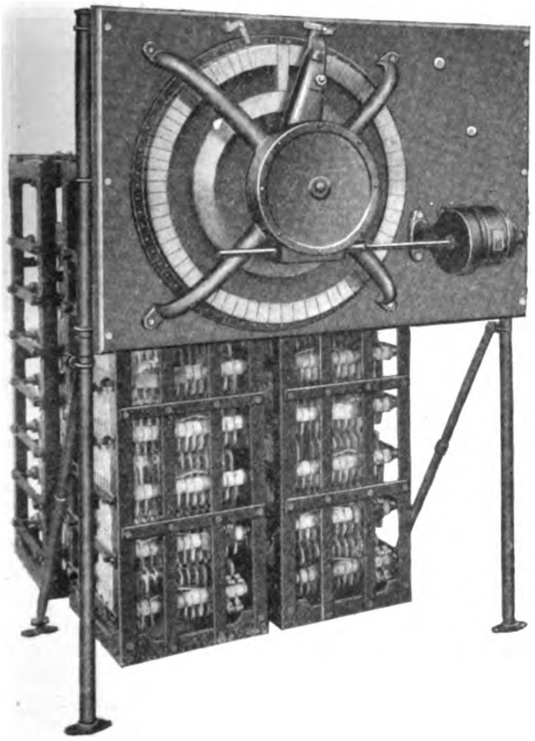


Gear driven, tube type, field rheostat. Made by General Electric Co., Schenectady, N. Y.

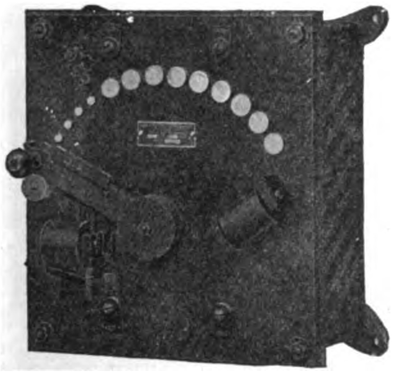
21-step motor field rheostat with field rheostat relay, for adjustable speed, d. c. motors up to 15 horse power. Made by The Electric Controller & Mfg. Co., 79th street and Woodland avenue, S. E., Cleveland, Ohio



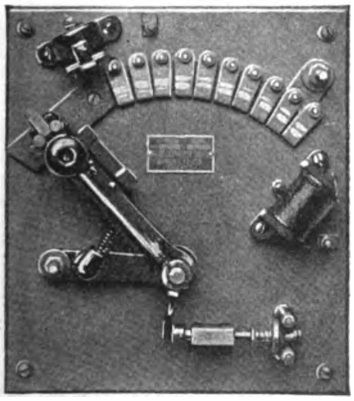
Sprocket driven, plate type, field rheostat. Made by General Electric Co., Schenectady, N. Y.



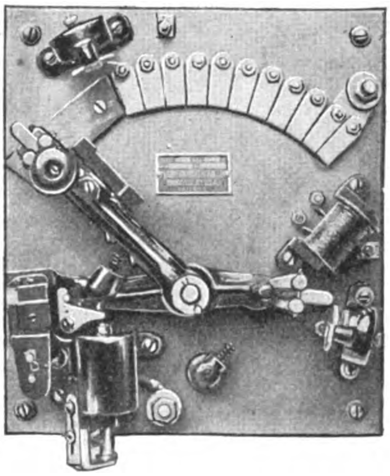
Motor operated, grid type, field rheostat, for field circuits above 300 amperes. Made by General Electric Co., Schenectady, N. Y.



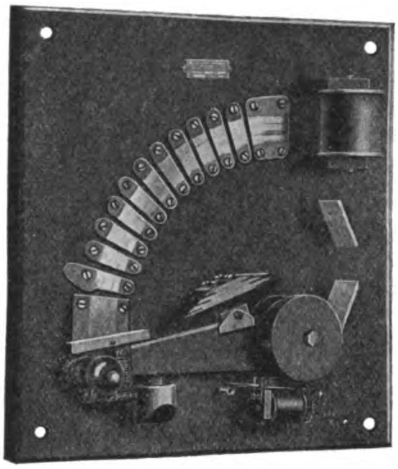
Motor starting rheostat with overload release, for starting shunt, compound, and series-wound direct current motors of capacities up to 120 horsepower. Also has low voltage release and a device to prevent arcing. Made by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



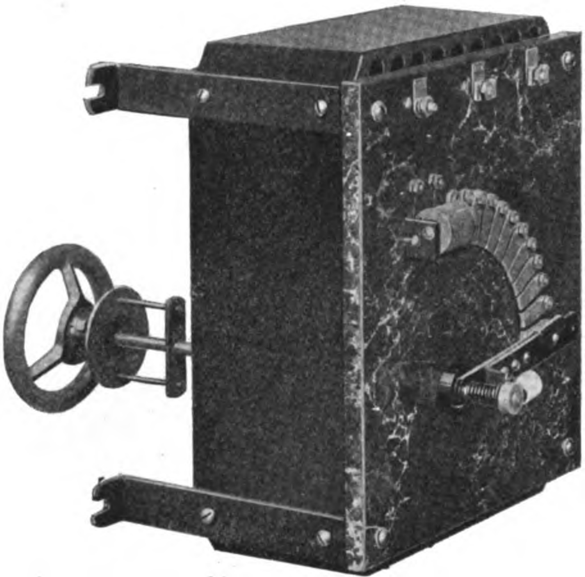
Motor starter with no-voltage release, dynamic brake, and push button release, for use in starting motors up to 50 h.p., and in enabling operator to stop motor instantly at any desired point by the operation of a push button; for 125, 250, and 500 volt circuits. Made by Ward Leonard Electric Co., Bronxville, N. Y.



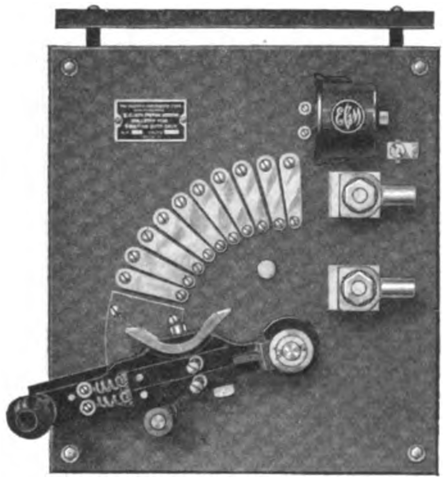
Motor starter with no-voltage release and overload circuit breaker, for use in starting any kind of d. c. motor up to 50 h.p., and allows of speed control by field regulation; for 125, 250, and 500 volt circuits. Made by Ward Leonard Electric Co., Bronxville, N. Y.



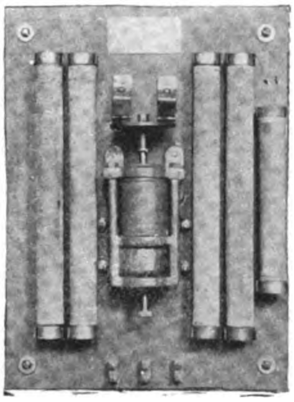
Field relay switch mounted on rheostat and used in connection with the rheostat in order to start the motor with full field strength regardless of the position of the rheostat arm. Made by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



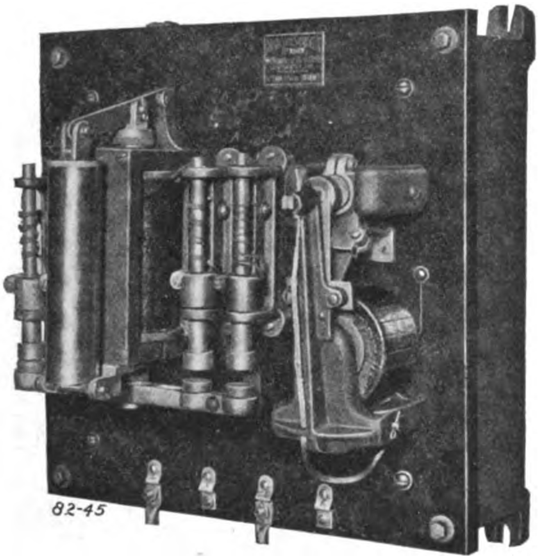
Face plate type, rear-of-board starter, with no voltage release, for starting d. c. motors up to 50 h.p., on 110, 220, and 500 volt circuits. Made by Union Electric Mfg. Co., 499 Broadway, Milwaukee, Wis.



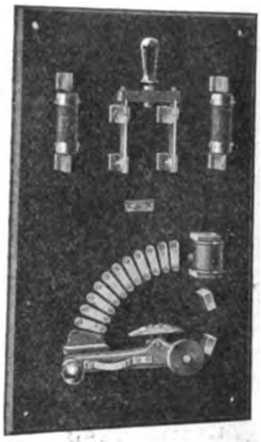
Motor starting rheostat with no voltage release, for series, shunt, and compound wound, d. c. motors up to 50 h.p., on 110, 220, and 550 volts. Made by The Electric Controller & Mfg. Co., 79th street and Woodland avenue, S. E., Cleveland, Ohio



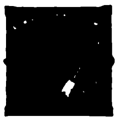
One-step, compound multiple magnet starter, for use in connection with tank switches or other remote control switches where motor circuit is broken independently; prevents too rapid inrush of current in small motors. Made by Automatic Switch Co., 4 and 6 White street, New York



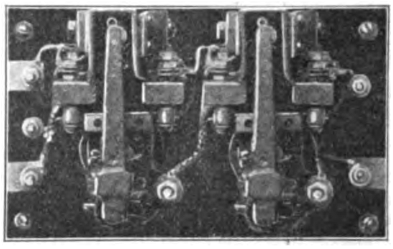
Automatic starter for pump work where the motor must frequently start its load regardless of current conditions; fixed time-element control obtained by a dashpot. Overload release also furnished where it is desired to limit starting current. Made by Monitor Controller Co., 111 South Gay street, Baltimore, Md.



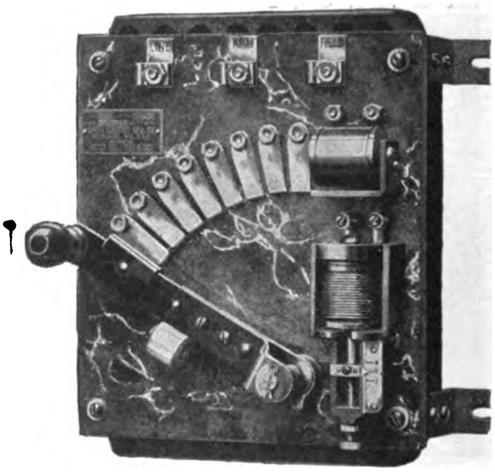
Starting rheostat and panel, for starting direct current motors up to 120 h.p., and for protecting them and the line from overloads and wide variations in voltage. Consists of a starting rheostat, and a line switch with fuses, mounted on slate base. Made by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



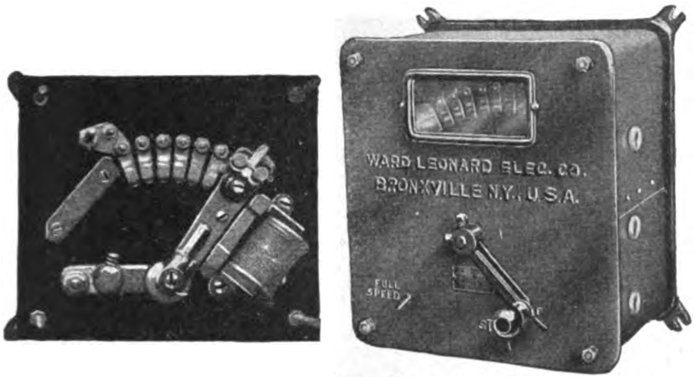
Starting rheostat with no voltage release, for small direct current motors. Made by Simplex Electric Heating Co., Cambridge, Mass.



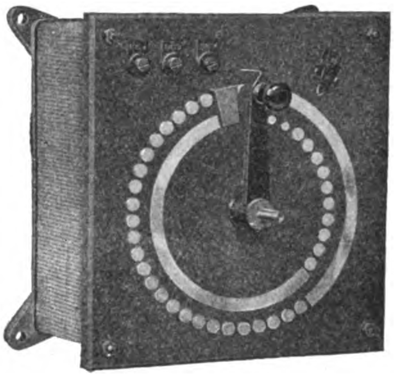
Self-starter, with no-voltage release, for use in automatically starting d. c. motors up to 20 h.p., from rest and accelerating to full speed; for 125, 250, and 500 volts. Made by Ward Leonard Electric Co., Bronxville, N. Y.



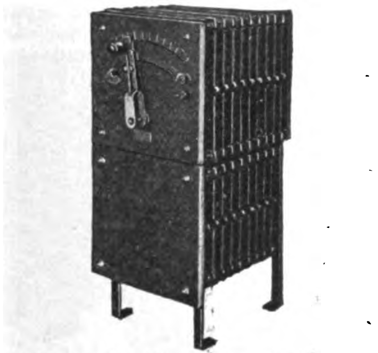
Motor starter with underload and overload release, for starting motors up to 50 h.p., on 125, 240, and 500 volt circuits. Made by Union Electric Mfg. Co., 499 Broadway, Milwaukee, Wis.



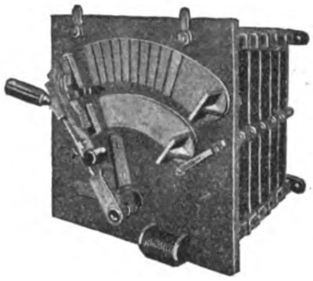
Motor starter equipped with tight casings enclosing all current carrying parts; for motors up to 20 h.p., in wet, dusty, or linty places where dust or combustible flyings are liable to accumulate on the rheostat; for 125, 250, and 500 volt circuits. Made by Ward Leonard Electric Co., Bronxville, N. Y.



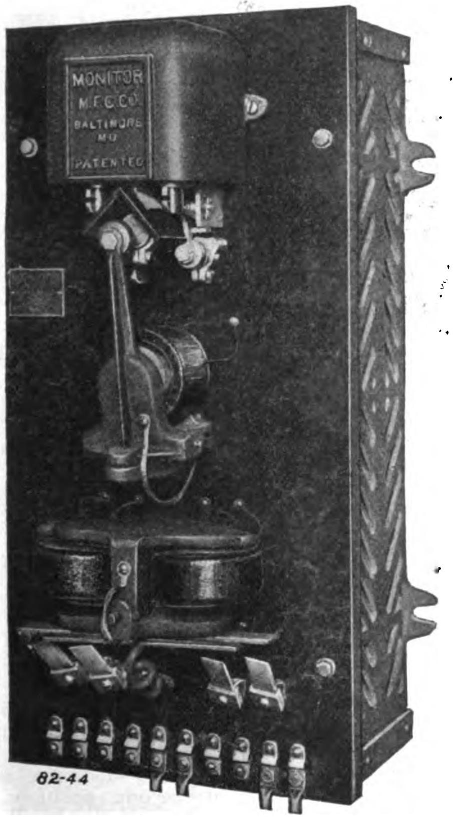
Non-automatic, starting and speed adjusting rheostat for shunt and compound wound d. c. motors up to 22 horsepower. Has sufficient field control steps to fit it for service where close speed adjustments over a wide range are required. Made by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



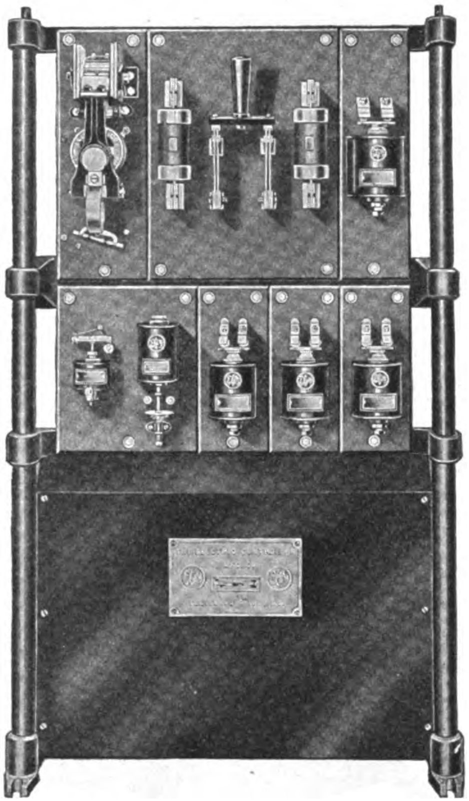
Plain series rheostat for armature circuit of 20 to 30 h.p., press motors. Made by Simplex Electric Heating Co., Cambridge, Mass.



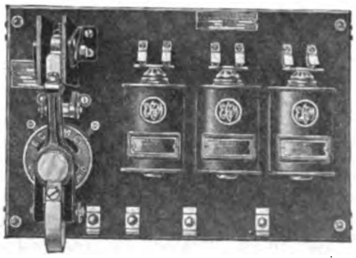
Starting and regulating rheostat with no voltage release, for 15 h.p. motor. Made by Simplex Electric Heating Co., Cambridge, Mass.



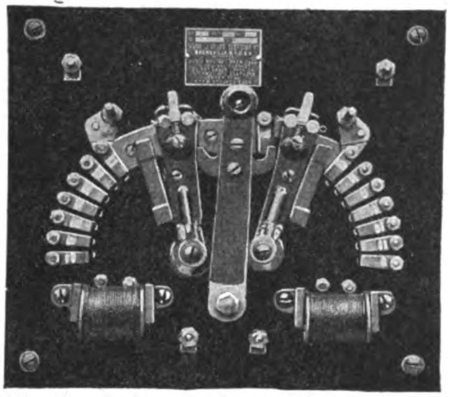
Remote control starter for starting and bringing up to speed motors operating all types of reversing machinery except planers. Permits of motor being geared directly to machine. Made by Monitor Controller Co., 111 South Gay street, Baltimore, Md.



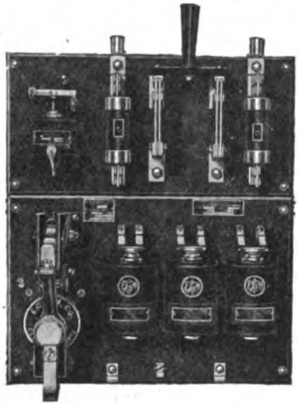
Automatic motor starter for non-reversing, d. c. motors; 30-110 h.p., 110 volts, 60-200 h.p., 220 volts, 110-200 h.p., 550 volts. Made by The Electric Controller & Mfg. Co., 79th street and Woodland avenue, S. E., Cleveland, Ohio



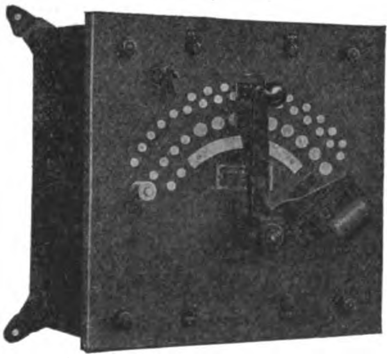
Automatic motor starter for non-reversing, d. c. motors, with remote control, no-voltage release; automatic acceleration secured by series-wound accelerating switches; operates with push buttons. Made by The Electric Controller & Mfg. Co., 79th street and Woodland avenue, S. E., Cleveland, Ohio



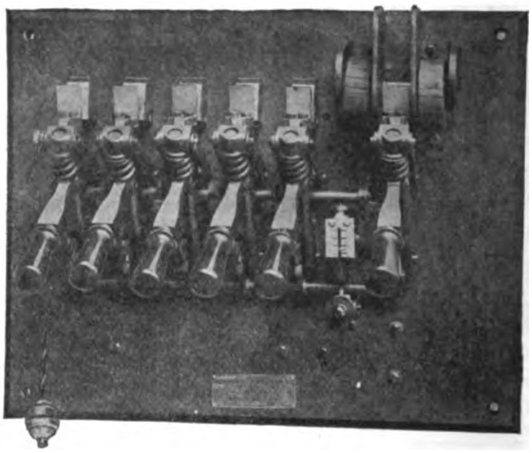
Reversing motor starter, with no-voltage release, for use in starting d. c. motors up to 15 h.p., from rest and accelerating to full speed in either direction of rotation; for 125, 250, and 500 volts. Made by Ward Leonard Electric Co., Bronxville, N. Y.



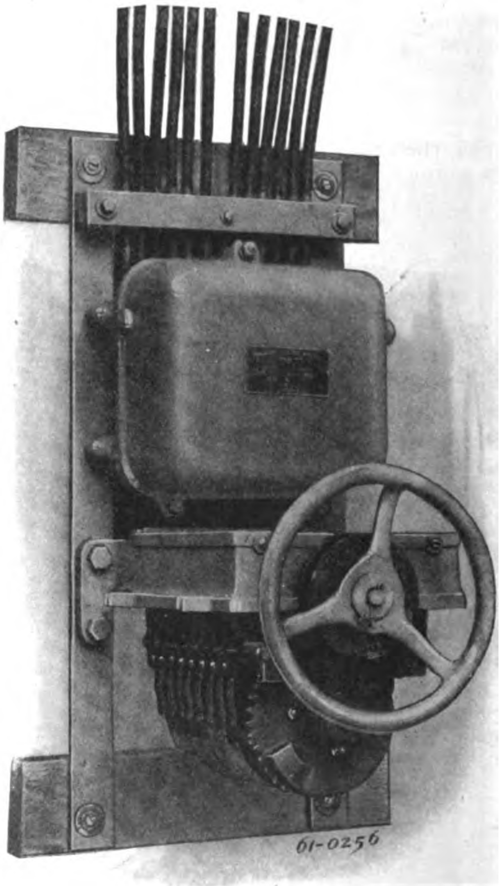
Automatic motor starter for non-reversing d. c. motors; with knife switches and fuses, and with remote control, overload circuit breaker, no voltage release; automatic acceleration secured by series-wound accelerating switches; operates with push button. Made by The Electric Controller & Mfg. Co., 79th street and Woodland avenue, S. E., Cleveland, Ohio



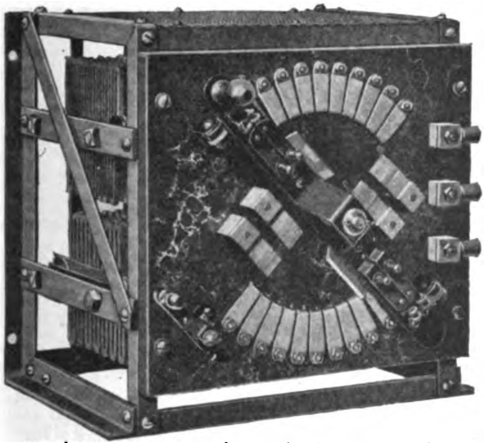
Starting and speed adjusting rheostat with low voltage release, for d. c. shunt and compound wound motors up to 35 horsepower. Used for starting and regulating the speed of d. c. motors in non-reversing services where speed adjustment by field control is desired. Made by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



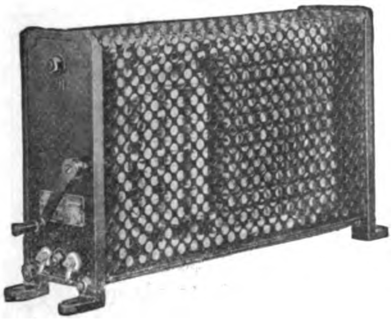
Single pole, multi-switch starter, for shunt, compound, and series wound d. c. motors up to 600 horsepower. Used in connection with motors of large capacity and with moderate sized motors starting under heavy load. Consists of a set of separately mounted resistors, and a panel carrying a group of switches and protective devices. Made by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



A polyphase squirrel cage motor requires a starter designed particularly for it. Illustration shows an alternating current starter designed for starting Wagner polyphase motors. To start motor, handle is turned clockwise to first starting position, then to second position, and finally to running position, where it locks. Line voltage cannot be applied to motor when at rest. All contacts are made and broken under oil to prevent arcing. Made by Wagner Electric Mfg. Co., 6400 Plymouth avenue, St. Louis, Mo.

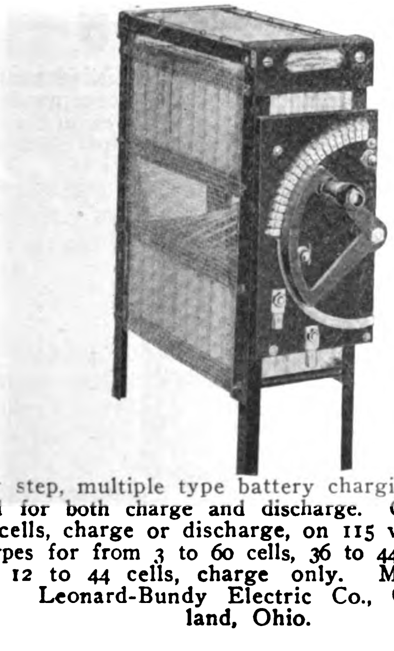


Secondary resistance starter for polyphase slip ring motors up to 50 horse power. Must not be used to control primary circuit. Made by Union Electric Mfg. Co., 499 Broadway, Milwaukee, Wis.

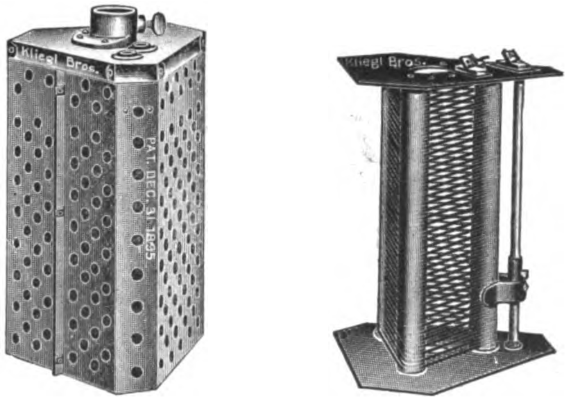


Battery charging, grid type, rheostat for circuits up to 115 volts maximum. Maximum capacities, 41-44 cells lead, 48-60 cells Edison batteries. Made by General Electric Co., Schenectady, N. Y.

Battery charging rheostat for garage duty, equipped with line switch and fuses. Made by Ward Leonard Electric Co., Bronxville, N. Y.

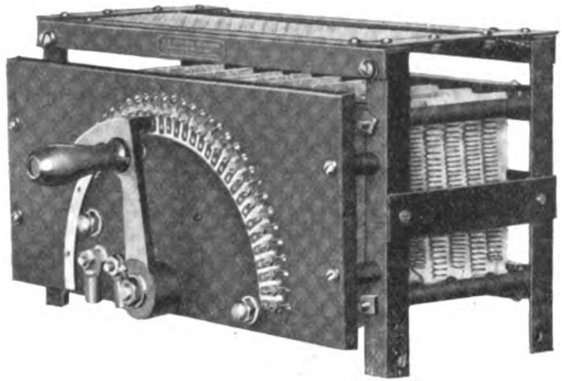


Twenty step, multiple type battery charging rheostat; designed for both charge and discharge. Capacity, 12 to 40 cells, charge or discharge, on 115 volts. Other types for from 3 to 60 cells, 36 to 44 cells, and 12 to 44 cells, charge only. Made by Leonard-Bundy Electric Co., Cleveland, Ohio.

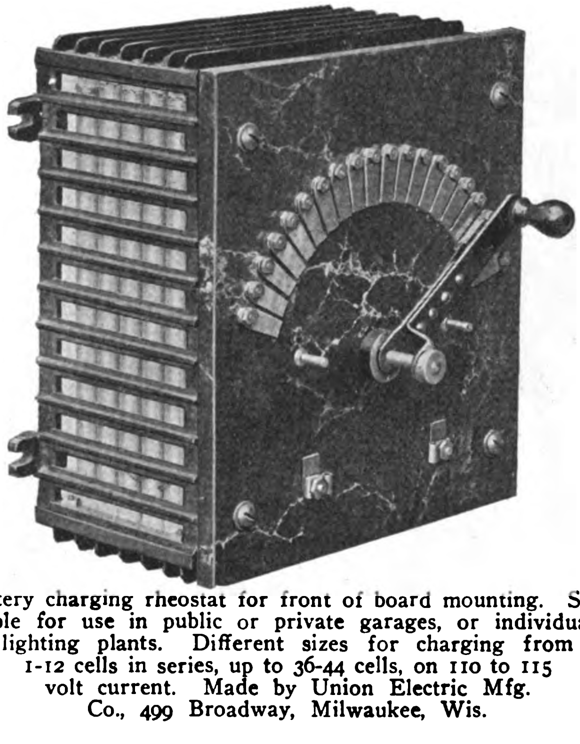


With case Showing coil

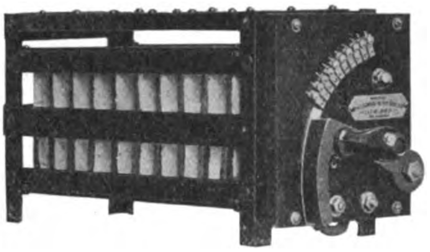
Adjustable rheostat for sciopticans used in theatres to produce various electrical effects; mounted at bottom of lamp stand. Can be regulated to suit any voltage up to 125 volts; other types for voltages up to 250 volts. Made by Universal Electric Stage Lighting Co., 240 West 50th street, New York.



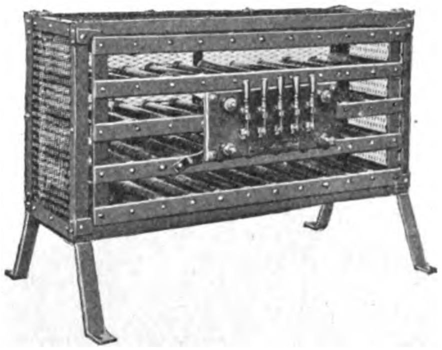
Thirty step, multiple unit type battery charging rheostat; designed for charging only, having sufficient range to meet garage requirements where a discharge is not necessary. Two sizes, capacities, 12 to 42 cells, and 24 to 42 cells, on 115 volts. Made by Leonard-Bundy Electric Co., Cleveland, Ohio.



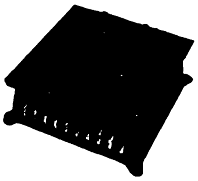
Battery charging rheostat for front of board mounting. Suitable for use in public or private garages, or individual lighting plants. Different sizes for charging from 1-12 cells in series, up to 36-44 cells, on 110 to 115 volt current. Made by Union Electric Mfg. Co., 499 Broadway, Milwaukee, Wis.



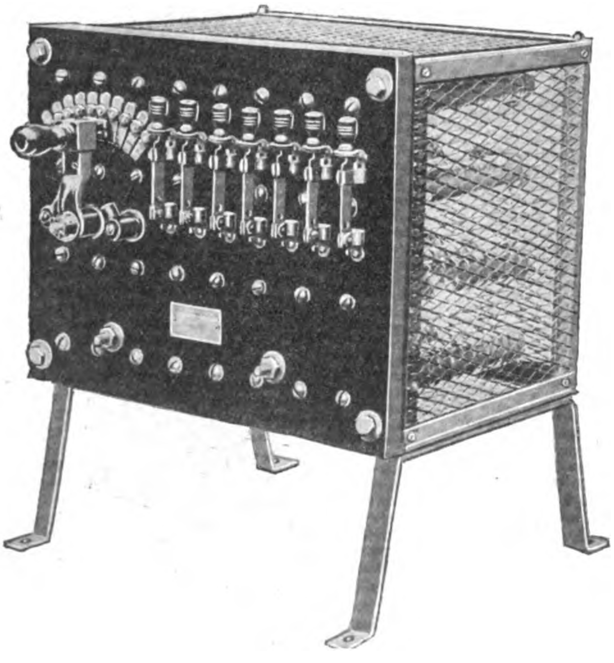
Ten step, multiple unit type battery charging rheostat; designed for use in private garage or where the number of cells to be charged is fixed. Three types; capacities, 24 cells, 12 cells, and from 3 to 36 cells (ignition) on 115 volts. Made by Leonard-Bundy Electric Co., Cleveland, Ohio.



Discharge rheostat, used as a load for controlling the discharge of storage batteries; for not more than 44 cells in series. Made by Ward Leonard Electric Co., Bronxville, N. Y.



Laboratory rheostat for adjusting flow of current in testing circuits. Made by Simplex Electric Heating Co., Cambridge, Mass.

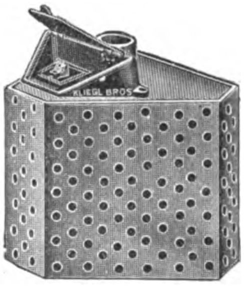


Laboratory rheostat for a. c. or d. c. circuits, providing an artificial load for testing of meters or generators. Made by Ward Leonard Electric Co., Bronxville, N. Y.

Lamp testing or photometer rheostat having 48,000 steps; gives .05 volt divisions when 5 amperes are passing; for testing of lamps. Made by Ward Leonard Electric Co., Bronxville, N. Y.

Regulating rheostat for electroplating tank. Upper dial is a multiplier between each step of the lower switch and produces an even and finer adjustment of current. Made by Simplex Electric Heating Co., Cambridge, Mass.

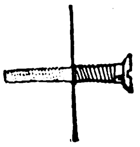
Line rheostate for plating machines; any desired number of amperes can be obtained by closing the proper number of switches. Ratings from 5 volts, 25 amperes, to 8 volts, 2,000 amperes. Made by Ward Leonard Electric Co., Bronxville, N. Y.



Fixed rheostat, furnished with lens and open box arc lamps for theatre use; mounted at bottom of lamp stand. Four sizes, rated at from 10 to 35 amperes, 125 volts for a. c. or d. c. circuits. Made by Universal Electric Stage Lighting Co., 240 West 50th street, New York.

CONTRACTORS' SCRAPBOOK

What is called "Soldering Kink No. 38" in a broadside on kinks in general issued by the M. W. Dunton Co., of Providence, R. I., has to do with the removal of a broken machine screw. This kink helps to explode the theory that women are without merit as practical mechanics, as a woman from Utica, N. Y., is the author of it. To remove a small machine screw when the head is broken off, says this author, or authoress, take a small soldering copper and tin the broken part of the screw, being careful not to get solder on the other parts. Then take a machine screw that is a trifle larger than the broken one, file the end bright and tin it. Sweat the two screws together with solder and when it cools a screwdriver will turn out the broken screw.



Removing a broken machine screw by sweating another screw to it with solder, and then turning both with an ordinary screw-driver

Contractors will note that there has recently been marketed an interphone system which provides service between a master-station in the kitchen, butler's pantry, or other convenient place and outlying stations in the various rooms and halls. By means of this system when a house is wired for call bells and annunciators it is possible to provide for a future intercommunicating telephone system at a very slight additional cost per station. Instead of the ordinary commercial type of call bell push button, a wall box receptacle and a two-hole wall plate the same as those used for electric lighting switches are installed at each station where intercommunicating telephone service will be required. The wall box is fitted with what is termed an apparatus unit, consisting of the push button with a set of springs and a jack. The two-hole wall plate fits over this, the upper hole engaging the push button and the lower one coming directly over the jack. No other wiring than that which would be installed for the usual call bell system is used.

In making comment on the nature and amount of electrical contracting work now in hand, The Howard P. Foley Co., Home Life Building, Washington, D. C., says it has been quite fortunate of late in landing quite a few of the largest contracts, in that section of the country. Although comparatively a new firm, it is probably doing more electric work in that section than any of its worthy competitors. "We are always ready to try out anything new in the way of electric appliances or labor savers." The company adds, "And we make an effort to keep in touch with what is going on around the country in regards to large installations, and the price of electrical materials. We do not restrict ourselves to certain lines, but go in for all branches of electrical engineering and contracting work. We follow all branches of interior and exterior wiring, the installation of power plants, and pumps, the erection of signs, and similar work." In conclusion the company says that other contractors might profit by learning that in all its jobs, big and little, it could install protected thread conduit at 15 per cent. less per foot than the old style pipe where the threads had to be cleaned and the couplings reversed.

Among the goods recently bought in this country for use abroad by soldiers in the fighting zones were five million electric pocket lamps. The demand for these lamps is due to the fact that on land the war has in large part become a long range artillery duel, the other branches of the service meanwhile seeking protection from bursting shrapnel by living in covered trenches. In these trenches as well as in the air, on the sea, or under it, electric pocket lamps are ideal illuminants.

"The Electrical Key" is the title of a 76-page pocket size pamphlet issued for the use of the electrical inspection bureaus advising electrical contractors and wiremen of corrections required so that their installations will conform to the National Electrical Code and municipal regulations. The book has been compiled and published by Washington Devereaux, Bullitt Building, Philadelphia, and is on sale at the price of 10 cents a copy.

In transformers the rapid reversal of the current produces an equally rapid reversal in the magnetism of the core. This reversal of magnetism results in heat, due, it is assumed, to molecular friction. This is known as hysteresis. Hysteresis losses naturally increase with the frequency of the reversals, and almost in a direct ratio.

In its department "Short Cuts and Minor Methods," the New York Telephone Review publishes an account of a simple method of vulcanizing tubes with a standard flatiron, used successfully by one of the contributors to the magazine: The tube is cleaned carefully around the puncture and coated with a cement made of raw rubber and gasoline; the patch is then treated in the same manner, and when the cement is nearly dry, the patch is placed over the puncture. An ordinary flatiron, which has been heated in the meantime, is placed on the tube, which is protected by a piece of newspaper. The iron is heated just hot enough so that it will not burn the paper, and is left on the patch until it has cooled, when it is found that the patch has firmly united with the tube. Blow-outs two inches long have been successfully repaired in this manner.

CONTRACTORS AND DEALERS NEWS

The Truax Electric Co., 306 Shipley street, Wilmington, Delaware, although a comparatively new concern, is forging rapidly to the front in the electrical business in that locality. The company has secured several of the largest contracts awarded in the last few weeks. Among its contracts in hand are: the old Hart residence at Seventh and Rodney streets, now owned by Dr. Albert Robin; the new $20,000 home being built by James F. Hoey, at Twentieth and Boulevard; the new store for G. Edgar Deering, now building at 823 Market street, and the electric work in the new Star Publishing Co. building. The company is finishing several large contracts and is bidding on more and has the best of prospects for a prosperous new year.

C. I. Ahlers & Co., 416 Third street, Red Wing, Minn., have the wiring contract for the Boxrud & Hjermstad Co. department store at Red Wing. Conduit will be used throughout, also semi-indirect lighting fixtures. This company is also installing a curb lighting system in Red Wing, the present plan calling for 76 ornamental posts and General Electric 4.4 luminous arc lamps.

The P. S. Nunn Electric Co., 2504 West Madison street, Chicago, Ill., has recently completed the following contracts: nurses' home of the Washington Boulevard Hospital, a three-story and basement building wired for light and power; also the new factory building of the Lucas Electric Device Co., at Warren and Western avenues, Chicago.

The South Western Electric Co., 4121 Charlotte street, Kansas City, Mo., reports the following wiring contracts in hand: five one-story and basement bungalows for Geo. H. Stier, located at 2614-2622 Indiana avenue; two-story and basement residence for Geo. P. Whyte, located at 12 East Concord street; two-story and basement bungalow for R. R. Cole, located at 36 East 54th street; two-story and basement residence for C. B. Carroll, located at 6002 Huntington road; two-story and basement residence for Jno. Young, located 3511 Walrond boulevard—all in Kansas City.
at 629 West 59th street; two 2-story and basement Queen Anne cottages for Gus Agee, located at 3509-

Jerdee & Hendrickson, manufacturers of electric, gas and combination fixtures, 804 East Lake street, Minneapolis, Minn., have been awarded contracts to install lighting fixtures in the following buildings in Minneapolis: Loeb Arcade, 5th street and Hennepin avenue; Christ Church, 34th street and 31st avenue, South; Vanderburg Church, 33rd street and 30th avenue, South; Crystall Lake Commercial Club, 2119 Crystall Lake road, North.

Among the many contracts for electrical wiring and equipment which have recently been awarded to The Howard P. Foley Co., Home Life Building, Washington, D. C., are the following: Emergency Hospital, Hitz office building, F. P. May warehouse, O'Donnell apartment, Gurley Memorial Church, Memorial to the Women of the Civil War—all at Washington; First National Bank building, Durham, N. C.; Capital Refining building, Relee, Va.; and the Chas. I. Corby residence and estate, at Garrett Park, Md. Among the fittings and materials used in these buildings are Metropolitan switches and receptacles, Sterling switchboards and panelboards, and enamel metals, protected thread conduits.

The Meadville Electric Supply Co., 166 Chestnut street, Meadville, Pa., has the contract to wire the Meadville City Hall. This is to be a conduit system with 118 outlets. Brascolite fixtures, made by the Luminous Unit Co., St. Louis, will be placed here. This concern has recently completed the following contracts: house for S. I. Stern; Bronze Metal Co., plant calling for 21, three-phase motors and 180 lights. The fittings used on these jobs include Universal knob supports, Matthews strain insulators and turnbuckles, Holophane reflectors, and Benjamin clusters. Other jobs done by this company include the Academy of Music, Meadville, Pa., three motors for sprinkler system and 400 lights in conduit, 12 stage plugs, lobbies, and galleries lighted by Eye-Comfort fixtures. *Tribune Republican* Publishing Co., 89 lights in conduit.

F. A. Culin, formerly engaged in the electrical business at 322 Chestnut street, Philadelphia, Pa., has retired from active business. Mr. Culin was one of the first men to enter the electrical industry, beginning his contracting business in a small way, 40 years ago.

The Jett Construction Co., 1815 South Governor street, Evansville, Ind., has the following contracts going through at the present time: Baptist Tabernacle, one story stucco, auditorium and individual class rooms, knob and tube system eight circuits. The wiring is completed, the fixtures consisting of 20 one-light ceiling, 12 brackets, and three Brascolites of 250 c.p. each, are now being installed. Other contracts include a five story hotel containing 50 rooms, calling for 55 telephones and a 20 hp. elevator motor. Washington Court apartment house, 12 apartments, knob and tube and vestibule letter boxes and tubes. Apartment house for Mrs. Geo. P. Heilman, three apartments, knob and tube, letter boxes, and door openers.

Carter & McKenzie, 1319 Broad street, Victoria, B. C., have taken over the premises and stock of the Hinton Electric Co., 911 Government street, Victoria. The Hinton company was liquidated several months ago, after a business career in that Province of over 25 years. Carter & McKenzie started business about three years ago. They now have under way the following contracts: complete electrical equipment for the new Victoria $500,000 drill hall; electrical equipment of the new $100,000 city jail building; underground distribution system, for light and power, for the house, grounds, and out-buildings forming the residence of the Hon. James Dunsmuir, at Hatley Park, near Victoria.

M. R. Johnson and E. M. Krabble have formed a partnership and have entered the electrical construction and repair business at 84 North Neil street, Champaign, Ill. Both men are well known in that locality, both having been connected with one of the local firms for the past eight years. They will do a general construction business and will also specialize in electrical repairing, and will be glad to receive catalogues from supply houses. Mr. Krabbe is a graduate of the electrical engineering school of the University of Illinois, and Mr. Johnson has had a wide practical experience.

James A. Atwood, electrical contractor, 127 North Jefferson street, Dayton, Ohio, has the contract for the U. B. Publishing House on West 5th street, Dayton, Ohio. The system installed will be for 110 volts direct current. The installation is all conduit. The Frank Adams Electric Co. will supply the panels and switchboards, the Crocker Wheeler Co. the generators. All machines on this installation will have individual drive and most of the units will be small. There will be over one hundred motors installed. The contractor aims to make this job attractive from a mechanical standpoint, as well as electrical, and is therefore paying more than ordinary attention to the details.

The United Electric Construction Co., 1727 Sansom street, Philadelphia, has recently closed contracts for the electrical equipment, including cables for light and power, in the leather works of the Thomas Janney & Co., Wissanoming; Keystone Leather Works, Camden, N. J.; Philadelphia Rubber Works, 37th and Reed streets, Philadelphia, and the Lentz Building, 17th and Ranstead streets, Philadelphia.

The Mason-Bouck Electric Co., Inc., 128 State street, Binghamton, N. Y., has been awarded the contract for the First Ward fire station at Binghamton. All the wiring will be done in iron conduit. The fixtures are to be let under a separate contract. Binghamton celebrated the holiday season with a public Christmas tree on the Court House grounds. The tree was lighted by 1,000 incandescent lights furnished and installed by local contractors without charge.

The contract for the electrical work in the club house now being erected for the Polish Union of America, in Fillmore street, near Broadway, Buffalo, N. Y., has been awarded to the Roche & Banas Electric Co., 1945 Seneca street, Buffalo. This contract calls for rigid iron conduit throughout. This concern also has the contract to wire the Church of the Assumption, located at Amherst and Grant streets, Buffalo, the second largest church in that city. Another contract calls for the wiring of a department store now building in Broadway, Buffalo, for Laufer & Zolte. None of these three contracts includes fixtures or glassware; these will be contracted for separately.

The Akron People's Hospital will be electrically equipped by The Edison Electric Supply Company, 109 South Howard street, Akron, Ohio. This is a complete conduit job. All the fixtures are semi-indirect. The contract includes all power wiring in the X-ray room, laundry machinery, hot water circulating pump, and dumb waiter. Each bed in the wards and private rooms will have one flush receptacle to attach stand lamps equipped with Dim-A-Lite sockets. The nurses' call system is of the type manufactured by the Holtzer-Cabot Co. This installation includes a system of twenty-seven inter-phones, which are to be selective signaling and common talking. There will also be installed a conduit for a private branch exchange.

The electric power and light wiring in the three story and basement I. O. O. F. building now going up at Maysville, Ky., will be done by the Electric Shop, of Maysville. The job consists of about 30 circuits, 3 panelboards, with mixed knob and tube and conduit. This concern has booked the O'Keefe three story store and office building, which requires a 10-circuit installation similar to that described above. Other jobs consist of the bungalow for Wood Owens and home of Chas. Bramel.

G. Sontheimer & Co., 1104 Prospect avenue, Cleveland, O., have recently secured a contract for the complete electrical installation for Sophia Hunting Parker Home for Aged Women, located in Medina, Ohio. All wiring is to be installed in rigid iron conduit. Hart push button switches and Hubbell flush receptacles will be installed. The panelboard will be equipped with new code enclosed switches. The contract calls for one refrigerator motor and one vacuum cleaning motor, also a complete system of call bells and annunciators, wires for same to be installed in rigid iron conduit.

Herman Andrae Electric Co., Inc., 135 Sycamore street, Milwaukee, Wis., has contracts to do electrical wiring in the following U. S. Post Offices: Arkansas City, Kans.; Wahpeton, N. D.; Greeley, Colo.; Delavan, Wis.; Lafayette, La.; Tupelo, Miss.; Bedford, Pa. This concern also has the contract for the electrical work in the St. Clement's Church, Sheboygan, Wis. They will shortly finish the electrical wiring in the new school building at Butternut, Wis., and in the Home for Feeble Minded at Chippewa Falls, Wis., also the Blackhawk Tavern at Fort Atkinson, Wis.

The Whitall Electric Co., Westerly, R. I., has the contract to electrify the Hospital for Feeble Minded at Exeter, R. I. This contract consists of complete electrification of six new buildings, all work to be in iron conduit. The buildings consist of the laundry, girls' dormimitory, boys' dormitory, boiler room and power house, addition to school building, and the female attendance building.

Edds & Goodman, electrical contractors, 301 West Falls street, Seneca Falls, N. Y., have the contract for the electrical wiring and equipment in the Fisher theatre at that place. Conduit with galvanized fittings will be used throughout. In the way of details there will be forty 40-watt lamps lining the porte-cochere over the sidewalk, an electric sign projecting from the second story, a 12-circuit Crouse-Hinds panel enclosed in a flush box in the foyer for controlling the lights in the lobby, exits, check rooms, reception rooms, and the sign. Other Crouse-Hinds panel boxes located at convenient points will control the lights in the rest of the building. The panel in the picture machine booth will also be of Crouse-Hinds manufacture; it will control the two machines. There will also be installed at suitable points intercommunicating and non-interfering telephones of Western Electric make. On the stage there will be one row of footlights and 4 border lights, each containing 32 white, 16-red, and 16 blue lamps, 4 circuits to each, also 2 proscenium strips of light of 12 lights each—this material being furnished by the Universal Stage Lighting Co. This theatre will have what is known as the mushroom heating and ventilating system, the fan being driven by a 5 h.p. motor. In this job the heaviest wire will be 250,000 cir. mils. All wire of No. 10 size and larger will be stranded, and Nos. 12 and 14 Duplex wire will be used for the lighting circuits.

H. G. Squires, electrical contractor, 666 N. Kellogg street, Galesburg, Ill., is wiring a new two-story hotel at that place, 46 by 85 feet. The first floor and basement will be used for store rooms, the three front rooms on the second floor for offices, and the rest of the second floor for hotel purposes. There will be four independent wiring systems requiring about 1,800 feet of ½-inch, 200 feet of ¾-inch, and 50 feet of 1-inch black enameled conduit. Four steel cabinets will be installed. The contract for the fixtures has not yet been let.

The M. & S. Electric Co., 617 South Saginaw street, Flint, Mich., will wire the R. J. Whaley three-story hotel and three store buildings at Flint. This is a knob and tube job throughout. The fixtures are to be chain drops prismatic reflectors. Similar work will be done in the Pastorino two-story store building. This company is also installing the electric fixtures in the new Y. M. C. A. building, about 250 Sechrist fixtures being installed, including those made by the Pittsburgh Lamp Brass & Glass Co.

Among the many contracts for electrical wiring and material recently awarded to the Schuylkill Electric Construction & Supply Co., 23 East Cole street, Shenandoah, Pa., are the following: Comique Theatre at Ashland, Pa. This is a rigid conduit job, and all the fixtures are placed so as to harmonize with their artistic surroundings. Another contract calls for the installation of the knob and tube system in 48 houses now building in Frackville, Pa.

The Borough of Milton, Pa., is putting up a $60,000 school building. This building is modern in every respect. The contract for the entire electrical work for light, power, and signaling systems has been awarded to R. H. Godcharles, 60 South Front street, Milton, Pa. In this building all wiring will be in conduit.

The following jobs have recently been awarded to the Beaver Engineering Co. of 59 Mechanic street, Newark, N. J.: Passaic Public School No. 12; Lincoln Public School, Elizabeth, N. J.; Franklin Public School, Franklin Furnace, N. J.; Myer building, Newark, N. J. This firm is also wiring the new saw mill for Jas. Crowell, Newark, N. J. These will be 150 h. p. in two-phase General Electric motors, the entire work being in conduit.

Hartman Brothers, Third & Williams streets, Williamsport, Pa., have just finished their contract to furnish and install 700 fixtures and accessories in the new Williamsport High School. Another job recently finished is the re-wiring and installing of fixtures in the Williamsport Reformed Church. This contract calls for two Type XA, Luminous Unit Co.'s Bracolite fixtures with 400-watt nitrogen lamps in bowls, and 40 watt Foster lamps in candles.

The new two-story and basement school at St. Clair, Pa., will be wired in knob and tube in conjunction with conduit construction by the Electric Construction Co., Inc., 26 North Fifth street, Reading, Pa. Flush switches will be used on all outlets throughout. The fixtures will consist of a Holophane installation, using prismatic reflectors. This concern has just completed wiring the Homeopathic Hospital in Reading, one of the largest electrical contracts of the year in that section. The building has modern electrical equipment throughout including motors for two elevators, laundry, and electric dumb elevator from basement to third floor. The principal feature of the electrical work is the nurses' silent call, which operates on 110 volts, the signals being given by lights instead of by bells and buzzers.

Isador Fajans, electrical contractor, 122 East 25th street, New York, will do the electrical work in the drill hall at Cornell University, Ithaca, N. Y. The wiring will be in conduit, both concealed and exposed, and a number of different kinds of fixtures will be used.

The Federal Reserve Bank has taken possession of the quarters lately occupied by the Hibernian at 79 W. Monroe street, Chicago. The electric wiring, done by the John W. Cronk Co., 125 N. Fifth avenue, has been entirely overhauled and made suitable to the needs of a government building. The lighting will be indirect units using nitrogen lamps. There is a complete system of telephones, call bells, annunciators, and time stamps. Adding machines, interest machines, dictaphones, and time stamps are all wired for from the boxes located near the entrance. Convenience has been sought regardless of expense. The ventilating will be taken care of by a direct driven fan in the attic.

The Edwards Electric Co., 34 West Front street, Red Bank, N. J., has received the contract to wire the Everett Brown house at Red Bank. This is a conduit job with 100 light outlets and 100 switch outlets. It includes a private electric water pumping system.

The Althoff-Howard Electric Co., 1505 Main street, Evansville, Ind., will look after the electrical equipment of the Indiana Trust & Savings Bank building now going up at 4th and Sycamore streets, Evansville. This building is liberally supplied with lighting outlets. Nitrogen lighting units will be used throughout. A feature of the electrical installation consists of a wall receptacle for about every 8 foot of wall space.

The Beck Electrical Construction Kompany, 204 Andrus Building, Minneapolis, Minn., has the contract for the installation of electric light and power wiring and fixtures for the Prospect Park M. E. Church. This contract was obtained on a time and material basis. The wiring includes motors for the organ and ventilating system. The fixtures will be made according to drawings furnished by the Beck company, and are the inverted or semi-indirect kind. They are made in a square bowl effect, with bars and glass between. The glass is art glass—all this for the auditorium. For the Sunday school rooms there will be ceiling fixtures of an ordinary pattern. The entire job is under the supervision of Edward Ludwig, architect. This concern also has the contract for the complete power and light installation in the new building for the Minneapolis Artificial Ice Co., including 212 horse power motors, and changes in the present switchboards, oil switches, circuit breakers, etc. This is also on the time and material basis.

Robt. F. Sinsel, 104 Madison street, Waukesha, Wis., will wire the one-story and basement office building, 103 by 26 feet for Hardy & Ryan, Waukesha, Wis. The floor and ceiling is concrete construction so the entire electrical wiring is to be installed in galvanized iron conduit. Besides the ceiling and side lights (total 35), there are to be ten Hubbell flush receptacles installed in the baseboard, five outlets just above baseboard for 'phones, and also outlets in baseboard for an electric bell system for calling. Six semi-indirect fixtures are to be installed in the front part of the building, most of the other ceiling fixtures will be one light chain pendents equipped with white shades.

The Clements Electric Co., Northport, Ala., has just completed wiring the Tierce building of four stories, also the Shirley building of two stories, both being knob and tube jobs. This company reports business a little slack at the present time but hopes to pick up immediately after the first of the year.

The Harrisburg Light & Power Co., Harrisburg, Pa., is wiring a new three-story building at that place. This building will have two store rooms and eight apartments, each consisting of a suite of rooms and bath. The contractor will install a complete telephone system in the vestibule, with a telephone in each apartment and janitor's quarters. The telephone in the vestibule is composed of a cabinet consisting of eight letter boxes. An electric door opener is connected inside the vestibule door and controlled by push button on phone in each one of the apartments. The apartment rooms will have the usual complement of outlets. The hall lights will be controlled by three and four point switches. A panelboard is installed in the basement, upon which the meters controlling the store rooms, public lighting, and apartments will be located.

As details of house wiring by electrical contractors are always welcomed by the contracting branch of the industry we publish here the gist of a letter on the wiring of an apartment house recently sent us by the Covic Electric Co., of 118 East 28th street, New York. "These buildings," the wiring company says, "are respectively the thirteenth and fourteenth buildings, representing a total of 362 apartments, that we have wired for the Bendheim Construction Co. The earlier buildings were wired in flexible conduit, but on the later buildings we found that the small additional cost of a conduit job was considered as a good investment by the owners, and the remaining buildings have been done in rigid enameled conduit throughout. On the present job we have also obtained the fixture contract. We carefully laid out the fixture requirements for each of the rooms of the apartments with attention to the use of chain sockets and control in general, one of the innovations being the use of the Cutler-Hammer pin switch in combined indirect and shower fixtures in the dining rooms. This gives convenient control of the light in the bowl of the fixture. We also make a special point of furnishing glassware which has a proper diffusing quality, and finally, that the finish in each of the rooms be appropriate. It sometimes seems as though we were forcing our opinions upon the purchaser, but the general favorable criticism by tenants, we think, has justified our opinions. These apartments are equipped with a very high grade of plumbing and gas stove equipment, and together with their up-to-date layout of the grounds, the percentage of vacancies, even in the recently completed buildings, is practically nil.

On bell work in these buildings, we are using a transformer in each building and are at present experimenting with contactless bells and buzzers, and diaphragm dimmers. The matter of private telephone system was rather thoroughly gone into, but unfortunately the telephone company provides and wires telephones complete in each apartment, and owing to these buildings being in such a large group, the telephone board controlling them is very large and justifies a very high grade equipment and a thoroughly efficient operator, so that private telephones are hardly necessary, as we must admit. These buildings are typical of the highest grade of non-elevator apartments now being built, and are in the section of the city known as the Dyckman section, developing rapidly."

Peet & Powers, 45 West 34th street, New York City, have the contract to wire a new residence now going up at Princeton, N. J. The contract calls for iron conduit, code wire, panelboards, and push button switches. The fixtures will be contracted for separately.

The electric work in the two-story basement residence for Mrs. Loehinger, Salem and Manhattan avenues, Dayton, Ohio, consists of combination knob and tube construction with conduit where necessary. James A. Atwood, 127 North Jefferson street, Dayton, has the contract.

Joseph D. Quinn, 10 South Hamilton street, Poughkeepsie, N. Y., has been awarded the electrical contract for Silas Lane's new residence at the corner of Livingston and South Hamilton streets, Poughkeepsie. The building will cost about $20,000, and will be wired in iron conduit. There will be a stationary vacuum plant in the basement, with remote control on each floor. Mr. Quinn has recently installed an efficient lighting system in the Arlington billiard rooms and bowling alleys, at 237 Main street, Poughkeepsie.

Fred. Tischer, electrical contractor and dealer in fixtures, at 612 20th avenue, East, Duluth, Minn., is wiring the Pitt home in Woodland avenue, Duluth. He is also wiring the Atkins and Barber homes, located in Woodland avenue.

Ernest Hermanns has recently opened an electrical and gas appliance store at 2437 Eighth avenue, near 130th street, New York. He will carry a full line of gas and electric fixtures, domes, and other appliances. In addition he will carry on his old business of electroplating and polishing.

GLEANINGS FROM THE N.E.L.A. QUESTION BOX

Reprinted from the Bulletin of the National Electric Light Association.

We have an inquiry from our city covering the question of electric lamps for fire alarm boxes. The idea is to use a small lamp, either red glass or enclosed in a red globe, to burn all night and every night. We would greatly appreciate information on the following points:

Candle power of lamps
Number of lamps
Length of contract
Price per lamp per year
Control, whether direct from series circuits or not
Type of fixtures
Who owns and maintains the installation.

Similar information on police reporting boxes, possibly using blue lamps or glass, would also be of use to us.

R. F. Bonsall—Baltimore was, I believe, the first city to adopt the system of designating the location of fire alarm boxes by the use of a lamp enclosed in a red globe placed on the top of the box. Several years ago a few of these lamps were installed, each one being connected to the meter of the nearest engine house, and were turned off and on by the Fire Department. The system proved such a success that in the past year practically all of the fire alarm boxes in the underground district have been equipped with 40-watt mazda lamps, until now we have possibly 125 boxes so equipped. These are owned and controlled entirely by the Fire Department. The Police Department does not use any electric lighting service in connection with the location of its boxes.

What do member companies consider the greatest obstacle at the present time in the path of electricity as applied to cooking?

C. C. Hellmers—Our company has had in operation for about three years, two electric ranges of one type and one of another. Our experience with these has been very satisfactory from the working side and we consider the greatest obstacle to be the excessive cost of operation, for even at the rate of ten cents for the first 20 kilowatts and three cents for all over that, in any one month the bills run $8, $10, and $12 for ordinary family cooking.

We have just installed a range of a new type, with the cooking compartments enclosed and are very optimistic that this will work economically, so as to make electric cooking more popular.

H. G. D. Nutting—There is no one obstacle that can be considered the "greatest" at the present time in the path of electricity as applied to cooking. There are several things that stand in the way. The first is the question of economy. Whether or not we are willing to admit it, electricity is not yet a competitor with gas for cooking, except in special cases where other conditions control. Another obstacle is that electric cooking is not as speedy as gas cooking; in other words, as high a temperature can not be quickly obtained with electricity as with gas unless the current is high. This seems to be due to the radiating efficiency of gas as compared with that of electricity. Another obstacle arising in connection with the introduction of electric cooking is that people have still to be convinced that electricity is better than gas for this purpose. When the real facts can be demonstrated, this can be done, but it will be done at a large expense to central station companies. Many central station men speak of electric cooking as being an off-peak load. For the ordinary station it is an off-peak load for two meals a day, but for the third it is certainly an on-peak load, and comes exactly on the station's very highest peak which usually occurs between half past five and six o'clock at night in winter. For example, take a company with about 1000 consumers, in a town of, say, 10,000 inhabitants; ordinarily at the present time such a company will have capacity to carry a peak of about 500 or 600 kilowatts. If three-fourths of its customers cooked by electricity and required a peak demand of about one and a half kilowatts each at supper time, it would require 1125 additional kilowatt capacity to meet this peak. Beside the capital charges growing out of this there would be the distribution system capital charges, due to the necessity for larger transformers and larger wires throughout the whole system. It seems that, for the present at least, the greatest possibilities in electric cooking lie in the development of the electric fireless cooker, the early disadvantges of which are gradually being overcome. Even with this a very much higher efficiency of heat insulation will have to be secured before the electric "fireless" can reasonably compete with gas.

C. S. Walton—Briefly, it may be said that the cost of current is the greatest obstacle. In this city, where the highest rate is 5½ cents a kilowatt-hour, the use of cooking appliances is growing very rapidly, people being willing to pay a little more for the convenience and novelty. Gas sells here at present at 70 cents per thousand feet.

What type and kind of junction box would you recommend using on a 220-volt, 3-wire underground Edison system, in a city where nearly all the manholes are as a general thing flooded with water in the spring?

A. K. Blaze—We would recommend using a junction box on the outside of and connected directly to the manhole. This can be opened readily without disturbing the latter. Installing the junction box inside the manhole is dangerous owing to the heavy accumulation of poisonous gases and of water. It is also objectionable because, should gases exist and an arc occur on the bus-bars, it would be liable to cause an explosion. It would also be necessary in every case for the workmen to pump out the water before working in the manhole and to remove the cover some time in advance in order to dissipate the gases.

The type of junction box known as the "Edison" provides ample working room and in it all current carrying parts are easily accessible.

Henry Stevenson—I would recommend a junction box set outside of and connected with the manhole, which can be opened without entering the latter.

Conference on a Proposed New Method of House Wiring

A hurriedly called special meeting of electrical manufacturers, jobbers and dealers, and contractors, was held at the Biltmore Hotel, New York, on the morning of December 22, 1914. About one hundred prominent men were present, all branches of the electrical industry being represented. The meeting was organized with George A. Cragin, of the American Steel & Wire Co., Worcester, Mass., as chairman, C. E. Corrigan, of the National Metal Molding Co., Pittsburgh, Pa., vice-chairman, and George H. Duffield, secretary of the National Electrical Contractors' Association, secretary.

Most of those taking part in the discussion said that they didn't know who called the meeting, what it was called for, and what they were expected to do. By way of enlightenment, Chas. L. Eidlitz announced that some time ago someone had appointed a committee consisting of Messrs. Blood, Lawler, Sargent, Forsyth, Devereaux, Paddon, Strong, and Dana Pierce, to investigate a new method of wiring—a wiring system similar to those now being used in both England and Germany. The method proposed, Mr. Eidlitz said, consisted of a single No. 14 wire embedded in good quality rubber insulation, the whole encased in a metal sheathing soldered at the joints so as to make it water-tight. Mr. Eidlitz exhibited a sample of the wire. The wire embedded in the insulation is to be used for the outgoing circuit, he explained, the return being through the metal sheathing instead of through a second wire. The general impression, he added, is that this system of wiring is to be used only for 660 watt circuits, and that it has the approval of the above named committee. "In conclusion," said Mr. Eidlitz, "I understand that at a meeting of the Underwriters in March this report is to be sent in, and it is supposed that the committee's recommendation to adopt this method of wiring will carry considerable weight with the Underwriters. And, if the Underwriters should, in March, adopt this method of wiring, or permit it, it would have a very serious effect upon nearly everyone's business in the electrical line."

A number of inquiries were made by those present as to the details of this wiring scheme and also as to its cost compared with the methods now in use. No one present seemed able to answer these questions in detail, but one speaker said he had heard that a wiring scheme which would cost $62 under the present plan could be done for about $28 by the new method.

Wallace Clark, of the General Electric Co., said that the system under consideration is not that now used in Germany, as many supposed, but an English system called the "Stanus Wire System." The German system, Mr. Clark said, is even cheaper than the English system; the outside cover, instead of being soldered, is crimped together. Mr. Clark said that the National Electric Light Association committee headed by R. H. Hale, of Boston, is urging the new system because the central station with which Mr. Hale is now associated, is anxious to introduce a much cheaper system of wiring so as to enable that station to reach a large number of customers that it cannot reach now. To meet this demand, in Boston and elsewhere, this system was first investigated and then suggested by the above mentioned committee.

Commenting on the patent situation, Mr. Clark said that no basic patents could be obtained on any part of this system in this country, and that any manufacturer would be free to make the fittings. Commenting further, Mr. Clark said that if the Underwriters should adopt this scheme in March, the manufacturers would have to go to work to design and build new machinery to make the wire, to build new molds for the porcelain parts, and also to make new forms of special fittings of all kinds.

A number of contractors and jobbers present said that so far as they were able to determine from hearsay about this wiring system that to adopt it would be equivalent to going back 12 years and throwing away all the time, effort, and money that had been expended in developing the highly satisfactory system now in general use. From the point of view of safety to both life and property, conflicting opinions were expressed about the efficacy of the new system as compared with the old. The few speakers present who were familiar with the proposed system seemed to have less dread of its consequences, both as to its effect on the industry and possible menace to life, than did those to whom this new wiring system comes as a radical departure from present methods. By vote of the meeting, Chairman Cragin appointed a committee to take up this matter, to make immediate investigation in regard to it, and to present their findings at another meeting of all those present to be held on February 9, 1915. In response to this motion, which was carried unanimously, the chairman appointed the following general and special committees:

GENERAL COMMITTEE

Chas. L. Eidlitz, Metropolitan Electric Mfg. Co., Long Island City, N. Y., chairman.

Wire—W. A. Connor, Standard Underground Cable Co., Perth Amboy, N. J.; R. K. Sheppard, B. F. Goodrich Co., Akron, O.; George A. Cragin, American Steel & Wire Co., Worcester, Mass.

Conduit—C. E. Corrigan, National Metal Molding Co., Pittsburgh, Pa.; F. C. Hodkinson, Safety-Armorite Conduit Co., Pittsburgh, Pa.; L. J. Campbell, The Western Conduit Co., Youngstown, O.

Fittings—H. B. Crouse, Crouse-Hinds Co., Syracuse, N. Y.; W. T. Pringle, Pringle Elec. Mfg. Co., Philadelphia, Pa.; A. W. Berresford, Cutler-Hammer Co., Milwaukee, Wis.

Porcelain—Herbert Sinclair, Star Porcelain Co., Trenton, N. J.; J. E. Way, R. Thomas Sons Co., New York City.

Jobbers—Frank S. Price, Pettingell-Andrews Co., Boston, Mass.; E. W. Rockafellow, Western Electric Co., New York City; W. W. Low, Electric Appliance Co., Chicago, Ill.

Electrical Contractors—Ernest Freeman, Freeman-Sweet Co., Chicago, Ill.; John R. Galloway, Washington, D. C.; John Livingstone, J. Livingstone Co., New York City.

Electrical Engineers—Gano Dunn, J. G. White & Co., New York City.

Fixtures—Louis McCarthy, The Macallen Co., Boston, Mass.; R. B. Benjamin, Benjamin Elec. Mfg. Co. Chicago, Ill.

Boxes—R. B. Corey, Pratt-Chuck Co., New York City.

Sockets—W. C. Bryant, The Bryant Elec. Co., Bridgeport, Conn.

Fuses—E. B. Hatch, Johns-Pratt Co., Hartford, Conn.; L. W. Downes, D. & W. Fuse Co., Providence, R. I.; Bryson D. Horton, Detroit Fuse & Mfg. Co., Detroit, Mich.

SPECIAL COMMITTEE

R. K. Sheppard, Chairman; H. B. Crouse, C. E. Corrigan, E. Freeman, Frank S. Price.

RECENT LEGAL DECISIONS

Of Special Interest to Electric Light and Power Stations

Liability for Fall of Pole—Care Required

An electric light and power company erected, pursuant to its contract with a city providing for a centennial celebration of its incorporation, poles supporting electric lights, and for the anchorage of cables designed to prevent people lining the sidewalk from entering on the streets proper during the passing of parades forming a part of the celebration. It was held not liable for injury to a spectator caused by a pole falling down by reason of a crowd pressing against the cable and encroaching on the street while viewing the parade. It was required only to exercise the care usually exercised by ordinarily prudent persons under similar circumstances, and might presume that people viewing parades in the streets would understand the character and purpose of the cables and would act accordingly.

Meehan v. Union Electric Light & Power Co., Missouri Supreme Court, 161 S. W. 825.

Right to Condemn Land

The complaint in condemnation proceedings alleged that the condemning corporation was organized for the purpose of maintaining water rights, watersheds, or water sources, equipping and operating acqueducts, tunnels, and pipe lines and for the selling and distributing of water and electric power. It was held that the corporation was entitled to condemn land under California Code Cw. Proc. § 1238, providing that land may be condemned for canals, reservoirs, for electric power lines, etc., and the fact that the complaint alleged certain purposes which were not expressly enumerated in the statute was no defense to the condemnation.

Deseret Water, Oil & Irrigation Co. v. State, California Supreme Court, 138 Pac. 981.

Wires and Trees in Streets—Neutral Rights

The Oklahoma Supreme Court thus states its views as to the relative rights and liabilities of owners of shade trees and wires in streets. A city has power of control over its streets, including spaces occupied by trees and wires thereon, but must act in good faith, and not abuse its exercise of this power. Both owner of abutting lot having an equitable easement in trees on street and owner of wires thereon may be in lawful occupancy of the street; and in such case, mutual and reasonable accommodation is due from each to the other. Ordinarily, an abutting owner growing trees on a street is a potential occupant of sufficient space, in addition to that actually occupied, for the perfection of the growth of such trees, and, without due compensation, cannot be excluded from any portion of such space to give exclusive occupancy to an owner of wires other than the city; and an owner of wires thereafter voluntarily occupying such space is not entitled, without due compensation, to injuriously trim such trees to sever or prevent contact with wires. Such owner of wires so cutting back such trees is a trespasser *ab initio* and liable to the abutting lot owner for all the consequential damages to his lot. Only public necessity, as contradistinguished from necessity of private owner of trees or wires, will justify the city's compulsion, and only the latter will justify either owner in excluding the other from space first rightfully occupied by such other by trees or wires on the street.

Norman Milling & Grain Co. v. Bethurem, Oklahoma Supreme Court, 139 Pac. 830.

Nullification of Ordinance Fixing Rates

The repeal of Missouri Rev. St. 1909, §§ 9568, 9569, 9570, conferring on the city of St. Louis authority to fix rates for service of public utilities operating under franchises within the city, repealed by Acts 1913, p. 651, § 139, vesting such power in the public service commission, is held to nullify the St. Louis city ordinance No. 24196, approved February 24, 1909, prescribing a maximum electric rate, and regulating the measurement of the service and furnishing of new lamps, etc.

Union Electric Light & Power Co. v. City of St. Louis, Missouri Supreme Court, 161 S. W. 1166.

Eminent Domain—Enforcement of Judgment of Commission

The Vermont statute, Acts 1908, No. 116, § 13, providing that whenever it is necessary to meet the service requirements of a public service corporation, such as a lighting company, that it should cross another's land with wires, etc., and it cannot agree with the owner as to questions of necessity or compensation, it may petition the Public Service Commission, which shall, upon due notice to all parties in interest, determine such questions and render a judgment, which shall be final, except as an appeal is allowed to the Supreme Court is held to be constitutional. The courts will enforce and protect the rights of the landowner and the public service corporation condemning the land after the commission has found in favor of the latter and awarded compensation.

George v. Consolidated Light Co., Vermont Supreme Court, 89 Atl. 635.

Powers of Arizona Corporation Commission

Arizona Laws, 1912 (Sp. Sess.) c. 52, § 7, requiring public service corporations to sell water, electrical energy or illuminating gas by meter measurement, and prohibiting them from charging for a greater amount than is actually furnished is held to conflict with Arizona Const. Art. 15, § 3, giving the Corporation Commission full power to fix the classifications, rates, and charges of public service corporations, except that cities and towns may be authorized by the Legislature to exercise supervision within their respective limits, since the constitutional power given the commission is not only full, but exclusive, except in the one instance wherein the Legislature is authorized to transfer such power to cities and towns; it excludes interference by the Legislature in every other way. Const. art. 15, § 3, vests the Arizona Corporation Commission with full power, with the command to exercise it: (1) To prescribe just and reasonable classifications to be used; (2) just and reasonable rates and charges to be collected; (3) reasonable rules, regulations, and orders by which public service corporations shall be governed in the transactions of business within the state. The functions of the Corporation Commission are held to be neither legislative, executive, nor judicial, but its duties and powers pervade them all, and it is in fact another department of government; and where it is given exclusive power, it is supreme.

State v. Tucson Gas, Electric Light and Power Co., Arizona Supreme Court, 138 Pac. 781.

Warrants for Electric Light Plant—Exceeding Constitutional Limitation

The Indiana Constitution, Art. 13, declares that no municipal corporation shall become indebted in an amount exceeding 2 per cent. of its taxable property. In an action against a town on warrants executed in payment of a debt due to an electric corporation on a contract for the installation of an electric light plant, it appeared that the debt limit for the defendant town at the time of the issuance of the warrant was $9,600. Previous to that time it became indebted in an amount of $3,500. In the first part of the year in which the warrants were issued, and at the same time as the contract with the electric corporation was entered into, the town entered into a contract with an engine company for the purchase of an engine for the plant. By the terms of these contracts the electric corporation was to be paid nearly $5,000, and the engine company over $2,000. Thereafter the town sold bonds to the amount of $6,000, and the proceeds, after paying for the site and building for the proposed plant, were divided between the electric corporation and the engine company. Upon completion of the installation of the machinery for the new plant, the town issued warrants in favor of the electric corporation. Indiana Acts, 1893, c. 100, under which the contract for the equipment of the light plant was made, provides that the contractors for such plant shall not be paid to exceed 75 per cent. of the contract price until the plant has been successfully operated for a period of at least 90 days. It was, therefore, held that the indebtedness in favor of the electric corporation did not accrue until the installation of the machinery after the issuance of bonds to the amount of $6,000, and hence the warrants issued to the electric corporation to discharge the last of its indebtedness were void, being in excess of the constitutional limitation.

Town of Sheridan v. Rothschild, Indiana Supreme Court, 104 N. E. 66.

Assumption of Risk

In an action for the death of an employee killed by an electric current while he was painting a bridge, the special findings of the jury showed that the deceased understood certain of the perils of his employment, and there was some evidence that he had knowledge of other perils, and it did not affirmatively appear that he had no knowledge of the particular peril which caused his death. It was held that an instruction that the servant does not assume the risks of his master's negligence was harmful error. A servant assumes the risk of the perils of his employment, even though they arise from the negligence of the master, if with knowledge and comprehension of the facts he voluntarily continues his service without a promise by the master to repair the defect. An instruction which based the assumption or non-assumption of risk upon the servant's comparative duty to discover, and know the conditions surrounding his work, and which excluded what he may have actually known, was held to be erroneous.

Terre Haute I. & E. Traction Co. v. Young, Indiana Appellate Court, 104 N. E. 780.

Warning of Danger—Contributory Negligence

A boy, 13½ years old, sought to recover for injury caused by contact with an electric light wire while he was picking cherries in a tree belonging to his father. The limbs of the tree projected over the street, and the wire was properly erected within the limits of the highway. Judgment for the plaintiff was reversed because the trial judge charged the jury that the defendant company told the plaintiff not to go up there and monkey with those wires, but that that did not say that they told him it was dangerous to touch the wires. This instruction was held to be erroneous, the plaintiff himself having testified that he had been warned of the danger. It was also held error to refuse to charge that if the jury found that the plaintiff intentionally touched the wire, he was guilty of contributory negligence, and could not recover.

Simon v. Commonwealth Water & Light Co., New Jersey Court of Errors and Appeals, 90 Atl. 288.

Interfering With High Power Wires a Crime—Statute Construed

California Pen. Code, § 591, as first enacted, referred in terms to injuries done to telegraph wires and appurtenances. Thereafter section 593, providing that every person who maliciously removes or interferes with any line erected to transmit electricity for light, heat, or power is punishable by imprisonment not exceeding five years, etc., was enacted, and subsequently section 591 was amended by St. 1909, p. 272, so as to provide that every person who maliciously injures or makes any unauthorized connection with any telegraph or telephone line or any other line used to conduct electricity is guilty of misdemeanor. In criminal proceedings under section 593 for interfering with and obstructing a light, heat, and power wire it was held that the amendment did not work an implied repeal of section 593, as the expression "any other line used to conduct electricity," used in section 591, must, under the principle of *ejusdem generis,* (namely, that where special words are followed by general words, the general words are taken to refer to things of the same general nature as those specified), be taken to refer solely to lines similar to telegraphs and telephones. It would be shocking to one's sense of proportion to think that a Legislature would deliberately classify the malicious obstruction of such a dangerous agent as high-power electricity used for moving cars, lighting cities, and operating machinery, with the interference that might arise from cutting a telegraph or telephone wire.

Ex parte Cannon, California Supreme Court, 138 Pac. 740.

MANUFACTURERS' NEWS

The name of the Independent Electric Mfg. Co., Milwaukee, Wis., has been officially changed to the Industrial Controller Co. The increasing use of the company's apparatus with the industrial concerns throughout the country, and for industrial purposes, has made it seem advisable to change the name of the company so that it might better describe the product. There will be no change in the personnel of the company, and the trade mark, I-C, will remain the same.

The Diamond State Fibre Co., of Bridgeport, Montgomery Co., Pa., has started a branch factory at 617 West Jackson boulevard, Chicago. The Chicago works will manufacture vulcanized fibre, Disfico horn insulation, and Diamond insulation for Middle West delivery.

Due to the unusual demand for its products, the Beacon Miniature Electric Co., formerly located at 108 Duane street, New York, has been compelled to remove its plant and offices to larger quarters at 118 to 120 Duane street, four doors above its old address. The company reports a very large sale of its "Ideal Fountainlight." The demand for this particular product was one of the things that compelled the company, at a most inconvenient time, to move in order to take on more loft space.

The Automatic Switch Co. is now located at 4 and 6 White street, New York.

The Habirshaw Wire Co. has removed its sales office, formerly located in the Metropolitan Tower, New York, to its works at Yonkers, N. Y.

The Reliance Metal Spinning Co., 13-15 Laight street, New York, reports having completed their catalogue No. 5, which will be furnished to the trade upon request. Every manufacturer, jobber, and dealer will find this catalogue interesting and valuable, as it shows the largest assortment of the latest designed fixture parts, for up-to-date fixtures.

The annual report of the Allgemeine Electricitäts Gesellschaft, Berlin, Germany, covering the fiscal year ended June 30, 1914, shows that despite the depressing conditions that existed for some time previous to the war the company did more business than in the preceding year. On account of the war, however, the business of the company has already been seriously affected, and in some foreign countries almost entirely destroyed. Out of net earnings of $4,723,160 a dividend of 10 per cent. on the capitalization of $38,750,000 was declared. The bank deposits of the company after the payment of the dividend were approximately $19,250,000.

The fire that destroyed part of the Edison Phonograph Works at Orange, N. J., on Dec. 9, did not in any way affect the Edison Storage Battery Co. One end of the large concrete buildings of the battery works is across the street from Mr. Edison's private laboratory, which was saved, and this, as well as the rest of the plant, escaped unscorched. The fire started about 5:20 p. m. and was well under control by 10 p. m. The telephone exchange was in one of the burned buildings, but through the prompt action of the N. Y. Telephone Co. a temporary switchboard was working in the battery office before business hours the next morning. The Public Service Electric Co. had emergency lines furnishing power about as quickly. The business of the Edison Storage Battery Co., therefore, suffered no interruption whatever.

Field rheostats for small generators and motors are now being marketed by the Ward Leonard Electric Co., of Bronxville, New York. Among them is a 6-in. diameter rheostat of their standard enameled type which has 18 steps of control.

The B. B. Company, 2 Park square, Boston, Mass., is now manufacturing all sizes and types of electric display signs.

The Westinghouse Electric & Mfg. Co. reports the following recent orders: West Penn Traction Co., Pittsburgh, Pa., a 19,000-kva., 6600-volt, 30-phase, 60-cycle, turbo generator. This is one of the largest machines in this district and will materially increase the capacity of the Connellsville power house. Monongahela Valley Traction Co., three 1500-kva., water-cooled, 60-cycle, 22,000-volt high tension Westinghouse transformers, and a complete electrically operated remote control switchboard in their big power house near Fairmont, W. Va. The switchboard is one of the most modern type and gives double protection on the intricate system of distribution employed throughout the coal fields of the West Virginia section.

The W. M. Dunton Co., 150 Niagara street, Providence, R. I., reports an active business in the Nokorode Solderkit which was illustrated and described on page 40 of our November issue. Over 500 of these outfits have been sold since they were put on the market a short time ago.

The Christmas advertising campaign carried on by the Westinghouse Electric & Mfg. Co. was one of the most extensive ever offered free by any electrical manufacturer. It included two 8-sheet posters, a street car card, a mailing letter, an ad. leaflet, and a cut-out.

The Cuthbert Electric Co., 723 W. Fulton street, Chicago, Ill., is building the switchboard for the new Conway building. The board is 21 feet long, made of black Monson slate. Weston voltmeters and ammeters, Duncan watt-hour meters, and Bristol graphic instruments form part of the switchboard equipment. This company is also installing and building the switchboard for the Lumberman's Exchange, now under construction. This board is 27 feet and 8 inches long, constructed of black Monson slate . The equipment includes ITE circuit breagers, Weston instruments, Sangamo watt-hour meters, and Esterline graphic meters.

The Chelten Electric Co., Philadelphia, Pa., has issued a 40 page illustrated catalogue. It contains descriptions of the full line of Chelten electrical specialties. This is the first 1915 catalogue to reach us.

The Connecticut Electric Mfg. Co., Bridgeport, Conn., has just brought out its catalogue No. 5, dated January, 1915. It contains 66 pages of descriptive matter and illustrations covering the products made by this company. Each section of the catalogue is indicated by a thumb marginal index, making it handy for reference.

BRANCH OFFICES AND AGENCIES

Do you want an agent? If so, we will put the notice here free. The same privilege is extended to agents desiring to represent manufacturers.

On blue page our readers will find an advertising section, giving the local address and telephone number of manufacturers' agents and branch offices of out of town concerns. The constant inquiries coming to the ELECTRICAL RECORD for this information caused this section to be started. It will be found especially useful by persons wanting immediate information. As a time saver it will be appreciated.

G. W. Barker, 526 North Hobart boulevard, Los Angeles, Cal., is aggressively covering the electrical trade on the Pacific Coast, and is in a position to handle one more good line, such as sockets, switches, and fittings of like nature. He invites correspondence from firms making such fittings, who are seeking representation in that territory.

The American Manufacturers' Agency, 111 Monroe street, Chicago, Ill., has been organized, with W. F. McKinlock as president. Mr. McKinlock was formerly president of the Metropolitan Electrical Supply Co. He has organized this agency to carry a full line of first-class electrical fittings and material.

The Cincinnati office of the C. & C. Electric & Mfg. Co., of Garwood, N. J., in charge of F. A. Saylor, has been removed from the Greenwood Building to 217 West 2d street, Cincinnati, Ohio. More space has been provided in the new location to permit the carrying of a large stock, so that shipments can be made direct without waiting to receive material from the factory at Garwood.

F. A. Brower has been appointed manager of the New York offices of the Oswego Machine Works. This office is located in the Singer Building, 149 Broadway, New York.

William F. Bauer has been appointed manager of the Chicago office, Edison Storage Battery Co., succeeding Chas. B. Frayer, who retired November 30 to devote himself to private interests. Mr. Bauer is a pioneer in the storage battery field and has been a familiar figure in railway and electrical circles of Chicago since he went there in 1906 as sales engineer of the Electric Storage Battery Co.

The Metal Specialties Mfg. Co., 736 West Monroe street, Chicago, Ill., has recently established the following agencies to handle the "Presto" electric hand lamp which is illustrated and described in the New Products section of this issue. The agencies are: J. B. Wilson Co., 220 Pleasant street, Boston, Mass.; Asch & Co., 1779 Broadway, New York City; Bailey & Drake Co., 604 Mission street, San Francisco, Cal.; G. H. Yates, 455 Equity Building, Detroit, Mich.

Winslow Goodwin, recently with the Goodwin & Kintz Co., Boston, Mass., has opened a sales agency for electrical appliances and lighting fixtures, glassware, and portables at 41 Pearl street, Boston. He represents manufacturers and will cover the trade in the New England states. Among the concerns which he will represent are: A. E. Rittenhouse Co., Pennsylvania Glass & Mfg. Co., Shiras-Chassaing Electric & Mfg. Co., Pittsburgh Reflector & Illuminating Co., United States Art Glass Co., Bright Star Battery Co., and the Goodwin & Kintz Co.

The American Manufacturers' Agency, Inc., 111 Monroe street, Chicago, Ill., has just taken the agency of the products of the Federal Electric Co., of Pittsburgh. This will give an outlet for Federal Electric Co.'s wares in the West and Northwest.

The New Process Specialty Co., 606 Enterprise building, Milwaukee, Wis., has just closed with A. Hall Berry, 97 Warren street, New York City, to handle its output in New York, Pennsylvania, Maryland, and New Jersey.

C. G. Reed and C. Leonard have formed a partnership to deal in electrical material and will represent manufacturers of Baltimore, Washington, and vicinity. The office of this firm will be at 705 American Building, Baltimore, Md. Both Mr. Reed and Mr. Leonard were formerly connected with the Westinghouse Electric & Mfg. Co. The above firm will succeed the establishment of Clinton G. Reed, 100 West Fayette street, Baltimore, Md.

J. M. Bateman, formerly salesmanager of the Minneapolis office of the Western Electric Co., has been appointed manager of the Cleveland office of the same company.

The Cutler-Hammer Co., Milwaukee, Wis., has removed its Cincinnati office from the Fourth National Bank Bldg., to Room 812 Gwynne Bldg.

Ralph B. Clapp, Los Angeles, Cal., is now representing the Electrical Engineers' Equipment Co., the Electro-Magnetic Tool Co., and the Pittsburgh Transformer Co.

The Robbins & Myers Co., Springfield, Ohio, announces the removal of their New York office from 145 Chambers street to 30 Church street, Room 400 E. The stocks of fans and motors will be handled at their warehouse, 155 Hudson street.

JOBBERS AND DEALERS

The Stuart-Howland Co., dealer in electrical supplies, has removed from 133 Federal street to the corner of Congress and Purchase streets, Boston, Mass. The move was made over the Christmas holidays so as not to interfere with business, which the company reports as active and increasing.

The Thompson Electric Co. has opened up an electrical supply, contracting, and repair shop at 102 West Lafayette street, Tampa, Fla. The company invites correspondence from manufacturers and jobbers, and asks for catalogues, terms, prices, and discounts. It prefers to do business on a cash basis. S. P. Thompson is president and treasurer; J. MacD. Thompson, vice-president and secretary.

"It serves you right," is the slogan of the Meadville Electric Supply Co., 166 Chestnut street, Meadville, Pa.

The midwinter meeting of the Westinghouse Agent-Jobbers was held at French Lick Springs, Indiana, December 3, 4, and 5. Matters of mutual interest were discussed and the following officers elected: president, N. G. Harvey, Chicago, Ill.; vice-president, S. L. Nicholson, Pittsburgh, Pa.; secretary, Max McGraw, Sioux City, Ia.; assistant secretary, H. T. Pritchard, Pittsburgh, Pa.; treasurer, J. E. McClemon, New York, N. Y. The object of the association is to promote close relations between the manufacturer and the agent-jobbers, with a view to providing more efficient avenues for distribution of electric appliances, and to popularize the use of electrical apparatus and supplies to the end that the purchase of such articles may be made easy and convenient for the ultimate user.

A. K. Peshkin, formerly in the electrical contracting business at 3 Rutgers place, New York, has recently opened an electrical supply store at 58 Essex street, New York, trading under the name of the Public Electrical Supply House.

The Western Electric Co. starts the new year by distributing the first edition of its 1915 Electrical Supply Year Book. This catalogue represents something new in the electrical supply field; it represents this company as adopting the definite policy of an annual catalogue which it believes will serve to give the industry at all times the most recent information obtainable on the materials which it uses. In place of the manufacturers' list prices which catalogues of this kind have heretofore invariably carried, this new book announces a complete series of Western Electric list prices upon which a uniform basic discount applies, such a discount indicating to the holder of the catalogue his approximate price on all the articles listed.

It is only a few years ago that the hardware business was carried on under the same unsatisfactory price conditions; that is, the necessity for the jobber to sell goods from manufacturers' lists, following the manufacturers' wide variety of differing discounts. This catalogue reduces all the various manufacturers' lists to a uniform jobbing list, so that in future the contractor who is called upon to estimate on jobs will not encounter a hopeless jumble of prices and discounts on wiring material and fixtures.

PERSONAL

H. R. Heller has removed from Fullerton, Pa., to Carlisle, Pa. He is now manager of the electrical department of N. E. Neusbaum & Bettilyon, contractors and engineers, at 146 South Hanover street, Carlisle.

Francis V. McGinness, sales engineer of the Edison Storage Battery Co., Orange, N. J., has been appointed assistant manager of the railway department, taking the position of William F. Bauer, who was recently made manager of the company's Chicago office.

At the annual meeting of the American Society of Mechanical Engineers held in New York early last month, John A. Brashear, of Pittsburgh, was elected president for the ensuing year. Mr. Brashear is known throughout the world for his excellent work in connection with the design and manufacture of optical instruments. Many of the lenses used in the prominent observatories throughout the country were made under his direction, among the most notable being those in the big telescope at the Lick Observatory in California.

Col. Edward D. Meier, former president of the American Society of Mechanical Engineers, died in New York on December 15. Col Meier was a veteran of the Civil War, and one of the most eminent mechanical engineers of the country. He was president of the Heine Safety Boiler Co., of St. Louis.

John J. Myer, 16 Medford street, Boston, Mass., formerly agent in that district for the American Circular Loom Co., 90 West street, New York, died at Boston on December 15.

ASSOCIATIONS AND SOCIETIES

"What Money Cannot Buy," was the subject of an address by A. J. Drexel Biddle, at a meeting of the Jovian Electrical League of Philadelphia, Pa., on December 17.

The National Electrical Contractors' Association will hold its next annual convention at San Francisco, Cal., July 18-24, 1915. The convention headquarters will be located in the Clift Hotel, at Geary and Taylor streets. The meetings will be held in the auditorium at Market, Hayes, and Larkin streets. The details of this convention will appear in our next issue.

The Proceedings of the 1913 convention of the Southwestern Electrical Gas Association are now being distributed by H. S. Cooper, secretary of the association. The volume just received contains 145 pages of printed matter covering papers, discussions, and the reports made at the business sessions of the association. It also contains the roster of members and the officers for the last year. The proceedings for 1914 are now in press and will be delivered early next year. The lag in time between the holding of the convention and the issuing of these proceedings is due to conditions attending the publication of papers and discussions emanating from a great many members of the association who are so busy with other things that they cannot take time to revise their remarks for final publication.

Greater prosperity through greater foreign trade is the objective of the Second National Foreign Trade Convention to be held at St. Louis, January 21-22, 1915. Three thousand commercial and industrial organizations, corporations, firms and individuals engaged in foreign trade, have been invited to send delegates.

The Board of Directors of the A. I. E. E. held its regular monthly meeting at Institute headquarters, New York, on Friday, December 11, 1914. In response to an invitation from the chairman of the public lands committee of the United States Senate, the president was authorized to appoint a special committee to appear at hearings upon the Ferris Bill relating to the development of water power, this being in accordance with the action taken last spring when the Institute was represented by a similar committee at hearings upon the same bill before the house committee on public lands. A communication from the American Association for the adoption of the metric system soliciting the Institute's co-operation, was referred to the standards committee. The president was authorized to appoint a constitutional revision committee to report at the next meeting whether in its opinion any revision of the constitution is desirable at the next annual meeting.

W. R. Warner gave a lecture on "An Evening with the Planets and Stars," at the 333rd meeting of the New York Electrical Society at 29 West 39th street, New York, on the evening of December 4.

On December 10th the Pittsburgh section of the Illuminating Engineering Society listened to a lecture in the Carnegie Lecture Hall by Professor W. D. Bancroft of Cornell University on the "Theory of Cold Light."

The next regular meeting of the Northern White Cedar Association will be held at Minneapolis, Minnesota, on January 26-27, 1915.

The American Museum of Safety held its second annual safety and sanitation show at the Grand Central Palace, New York, from December 12 to 19. One of the most interesting exhibits from an electrical point of view was that of the New York Edison Co. Here were shown many of the appliances used by the company to insure the safety of its employees and the public. The various types of fire alarms were shown in the booth occupied by the New York Fire Department. Several of the trunk line railways also had exhibits.

During the annual convention of the American Society of Mechanical Engineers in New York last month, President Hartness said that, in addition to the regular treasurer's report, there should be a human report. This report, he said, would begin with a description of the directors and go through the entire organization. It would contain a statement regarding the elements of harmony of organization; of length of service of manager and workers; the frequency of change of methods or article manufactured; intelligence of executives in the management of men; the degree of contentment of each member; the extent to which each man in the organization approaches the best position for which he is endowed, and how nearly he obtains the best remuneration for which he is qualified; the extent to which the management recognizes the inertia of habit of both mind and body; the degree in which the various men in the organization approximate the condition of highest efficiency; the extent to which the management goes in expression of appreciation; the degree of its knowledge of the most important characteristics of man as indicated by his inner motives and desires, and the condition of his mind as he goes to his home at night.

At a recent meeting of the committee on nomenclature and standards of the Illuminating Engineering Society the committee resolved that the output of all illuminants should be expressed in lumens; that illuminants should be rated upon a lumen basis instead of a sandle-power basis; and that the specific output of electric lamps should be stated in lumens per watt and the specific output of illuminants dependent upon combustion should be stated in lumens per British thermal unit per hour. The resolution was approved by the council of the society, December 10, 1914.

ELECTRICAL DEVELOPMENT SOCIETY

"Electricity in the Home" and "Household Electricity" are the titles of two new booklets recently issued by this society. The reading matter in both books is the same; the chief difference lies in the fact that the former book contains half-tone illustrations of typical exteriors and interiors. These books will be furnished to members of the society at special rates, which can be obtained upon application to the society's offices. A pamphlet entitled "Key to Manufacturers" will shortly be issued for reference use. This pamphlet will contain the names of all members of the society who manufacture the devices described in these booklets.

Gummed and perforated sheets containing 20 one-color poster stamps measuring 1½ by 2¼ inches, have just been designed and printed by the society, and will be furnished to members only at the rate of $1 for 100 sheets.

The motion picture department has spent the money laid out for the year during the period from May 1 to October 31, the idea being that it was better to spend the money in six months and get immediate results than to try and spread it over the entire twelve months; the result is that five reels are now being exhibited, each one in 45 different cities and another reel is nearly completed. It is estimated that 12,000,000 people will see these reels each month.

They are to run for a year. Mr. Smith, who had charge of that work, is no longer on the payroll, and his resuming work will depend on the decision of the executive committee in the spring as to whether more motion pictures are wanted.

The society has a membership to-day of 1,213, after removing from the list 160 who have not paid their first half year's subscription and 47 whose subscriptions have been cancelled for one reason or another, most of them having gone out of business. The present staff consists of 16, the work being divided into seven sections, each section being in charge of a manager, the remainder of the staff being the necessary assistants and office force. The payroll amounts to $3,473.34 per month (average) and the average expenses since June 1 amount to $3,863 per month. There has been practically no money expended upon membership campaigns since June 1, the entire staff having devoted itself to the active work of the society. The work of the various sections is fully described in the report to members, just published.

FOREIGN TRADE OPPORTUNITIES

E. W. Ames and José Camprubí have formed a partnership to conduct a Latin American Service Bureau, with headquarters at 3636 Grand Central Terminal Building, New York. They offer a more personal and more efficient service, and at less expense, than can be obtained in any other way. Both of these men are unusually well qualified to represent electrical manufacturers and others in Central and South America. Both speak English, Spanish, French, and Portuguese. Mr. Ames was in the diplomatic service in Brazil, Argentine, and Chili from 1900 to 1906. From 1906 to 1914 he was engaged in business in Chili and Argentine. Mr. Camprubí was engaged in electrical engineering work in the States from 1902 to 1911. From 1911 to 1914 he represented the General Electric Co. in Argentine, Uraguay, and Paraguay. Both Messrs. Ames and Camprubí have travelled extensively in South America, and have a wide acquaintance in political, social, and business circles in Latin America. They know the peoples, their requirements, and their method of doing business.

No. 14774. Electric Incandescent Lamps.—An American consul in the United Kingdom reports that a firm of manufacturers of special metals and drawn wire in his district is desirous of communicating with manufacturers of electric incandescent lamps, with a view to purchasing in considerable quantities.

No. 14812. Electric Apparatus.—The manager of a municipal electric plant in Europe desires to be placed in communication with manufacturers of electrical supplies and fittings, including lamps. Name and address of the inquirer may be obtained from the Bureau of Foreign and Domestic Commerce and its branch offices.

No. 14804. Hardware, Electrical Supplies, Etc. —A commission firm in Russia informs an American consular officer that it desires to establish direct relations with American manufacturers of hardware, tools, and implements, files, meat choppers, ice-cream freezers, grinders, petroleum kitchen and heating stoves, and electrical supplies and lamps. Correspondence should be in Russian, French, or German. References are given.

No. 14807. Trade Extension.—An American consular officer in South America reports that an electrical engineer who has had many years' experience in the markets of South America expects to be in the United States during the winter months, and will be pleased to meet American manufacturers who may wish to establish relations with Latin American countries.

No. 14522. Electric Motors and Accessories. Lathes, Tools, Steel Cables, Etc.—A large firm abroad wishes to correspond with reliable firms in the United States manufacturing the above articles. The consul states that it can furnish excellent references. Correspondence may be in Russian, French, or German.

No. 14604. Arc-Lamp Carbons.—A consul reports that a firm in his district is anxious to be placed in communication with American manufacturers of arc-lamp carbons. The concern in question is a large buyer of this class of goods as well as of other electrical accessories. Owing to the disturbed commercial conditions in Europe the firm must seek supplies elsewhere.

PUBLIC SERVICE NOTES

On January 1st Byron T. Burt's resignation as general manager of the Chattanooga and Tennessee River Power Co. will become effective. He will be succeeded by George S. Baker, who has been auditor of the company since it opened offices in Chattanooga. Mr. Burt will go to Buenos Aires early in the year as manager of the South American Trading Co., and will open the main office of that concern for the sale of American manufactures in Argentina. He has been conspicuous in Chattanooga business circles for several years, having been manager of the old Chattanooga Electric Co. until its consolidation with the Chattanooga Railway and Light Co. When the Chattanooga and Tennessee River Power Co. was organized to construct the Brady power plant at Hale's Bar on the Tenesese River, he was made general manager.

The Worcester Suburban Electric Co., Uxbridge, Mass., has just issued a booklet giving rates and general information concerning electrical energy for lighting and power. Owing to the limited market in that section of the country the company charges 14 cents per kilowatt-hour for a primary rate and 12 cents per kilowatt-hour for the secondary rate. It makes a minimum charge of $12 per meter per year, payable in monthly installments. Adjusting credits are issued under certain conditions. Power for cooking, heating, and any other use except for lighting, costs 6 cents per kilowatt-hour, with a minimum charge of $2.50 per month. The power rates vary from 6 cents per kilowatt-hour for the first 100 kilowatt-hours a month to .014 cents per kilowatt-hour for everything above 15,000 kilowatt-hours a month. The company will furnish without additional charge, overhead service lines for a distance of 300 feet from the street, the consumer paying the cost of all construction in excess of that distance. Underground service wires will be supplied for a distance of 100 feet if the consumer will pay the expenses of all conduit pipe and laying. For distances above 100 feet the consumer must pay all in excess. The company furnishes free renewal of Edison plug fuses up to and including 30 amperes, upon return of burned out fuses. The price of mazda lamps varies from 20 cents for the 50-watt lamp to 90 cents for the 150-watt lamp. The service is both single and three phase 60-cycle alternating current, 108 and 216 volts for lighting, 220 and 550 volts for power.

Writing on "The Electric Railway and the Farmer," in the *Electric Railway Journal,* John R. Graham, president of the Bangor, Me., Railway and Electric Co., gives this as one example of what trolley lines can do to develop agriculture:

> In order to encourage the raising of potatoes in the Kenduskeag valley, the Bangor Railway and Electric Company in 1908 reduced the electric freight rates one-half on carload lots of potatoes. In that year 67 carloads were shipped. The business has increased greatly each year, and in 1913 more than 600 carloads were shipped. During the present season it is anticipated that more than 750 carloads will be handled by the line, representing an increase of more than 1100 per cent. in six years, and on a line only 25 miles long, with a population of but 2,500 people.

PUBLIC UTILITY RULINGS

CALIFORNIA

In deciding that the amount heretofore set aside by the Coast Valleys Gas & Electric Co. is adequate, the commission says that it is the duty of a public utility to keep its operating property in the highest state of efficiency consistent with economical operation and with due regard to the character of the service supplied by it. This is accomplished by proper expenditure for maintenance or current repairs and by such replacements as may become necessary from time to time. However, the commission is not inclined to create any undue burden upon any public utility by requiring that a depreciation reserve, larger than that which experience has proven adequate, be set up.

In considering the complaint of the City of San Jose, Cal., against the reasonableness of the rates, service, and extensions of the Pacific Gas & Electric Co., the commission holds that, as generally recognized by rate fixing authorities, a utility is entitled to a reasonable minimum rate sufficient to cover interest on cost of service connection and depreciation thereon. The company's present minimum of $1 was held not to be unreasonable, though as, in a particular case cited, a meter in the city hall for electricity used for heating purposes in winter only, where energy is used only during a few months in the year, a rule may be incorporated permitting the disconnection of the meter, thereby eliminating such minimum charge during the period of non-use.

The commission followed the United States Supreme Court in holding that a utility accepting a franchise from an incorporated city, permitting of the construction of its lines over all streets of such city, by constructing such lines over a portion of the streets, thereby obligates itself to extend service to any portion of such city where it may be desired. Sufficient allowance was made in valuation of the company's property to cover all desired and estimated extensions and the company was directed to make all such extensions within the limits of incorporated cities affected by the decision at its own expense. It was held that the commission has jurisdiction to compel utilities to extend any reasonable distance irrespective of the provisions of the California Civil Code limiting such extensions to 100 feet. Such statute being inconsistent with the provisions of the Public Utilities Act, was held to have been repealed by section 87 of such act as it affects territory over which the commission's jurisdiction extends. The company was directed to make all extensions desired in unincorporated territory at its own expense, at least up to the amount allowed for this purpose, provided that, when it may deem such desired extensions unreasonable, it may apply to the commission for relief from this particular provision of the order.

In the matter of Salinas City v. Coast Valleys Gas & Electric Co., the following rates for lighting were established: for general lighting, first 20 kilowatt-hours per month, 8 cents per kilowatt-hour; next 30, 6 cents; next 300, 5 cents; all over 350, 3 cents; minimum charge, $1 per meter per month. For lighting purposes, 10 cents per year per watt connected.

With reference to contractor's profits in estimating the cost to reproduce the physical elements of the property, it was said that if it was desired to estimate such cost as of a certain date and it was thought more economical to have the work done by a contractor, a contractor's profit must of course be included in the estimate. On the other hand, if it was thought more economical to have the utility itself do the work, there should be no contractor's profit, although in that case certain items might cost more than they would cost if a contractor did the work.

The Western States Gas & Electric Co. complained against the Sierra & San Francisco Power Co. and alleged that the rates charged it by the defendant for electrical energy were unduly high. Subsequent to the hearing, both parties agreed upon a reduced schedule of rates, effective until January, 1924, and applied to the commission for the approval of this schedule. The schedule was approved for a term of five years, the commission saying that the whole status of the generation and delivery of electrical energy changes to such a marked degree from time to time that to make an agreement now to be binding until 1924 would be unwise.

The Pacific Gas & Electric Co., desiring to renew a power contract with the Diamond Match Co. containing a rate considerably lower than the published schedule, petitioned the commission for permission to execute such a contract for a five-year period. It was held that, though the rate contained in the proposed contract will not yield a fair return upon the investment in equipment used in the service of the Diamond Match Co., such investment has already been made, and to discontinue its use would but render the entire investment practically valueless, and also in view of the fact that the applicant has considerable surplus energy, the application was granted, provided that said rate shall likewise be open to other consumers using a like amount of energy, and that such contract shall not be binding upon the commission.

A complaint was filed for the purpose of compelling an electric company to install circuit breakers of the overhead release type on all transmission lines operated by the defendant company in the State of California. The complaint alleged that the defendant company did not properly protect its heavy transmission mains, operating them without fuses or automatic circuit breakers, thereby greatly endangering life and property. After investigation it was found that though the company had taken considerable steps to safeguard their employees and the public, certain additional steps should be taken properly to protect their high power transmission lines. The company was given thirty days in which to submit, for the approval of the commission, plans for the installation of such additional safety devices. It was considered advisable to the commission to investigate further the construction and maintenance of all power, telephone, telegraph, and signal lines as well as the operation of such lines. The commission's electrical engineer was therefore directed to further investigate the subject complained of, with a view to requiring all utilities of this nature to comply with such reasonable safety requirements as might be deemed necessary. W. S. Junkin v. Pacific Gas and Electric Company.

A company operating a gas generating and distributing system in certain portions of Los Angeles County, Cal., found itself in the position of charging $1 minimum over a certain portion of its system, a 50 cent minimum over another, and no minimum at all over the balance, and therefore applied for permission to establish the dollar minimum per month over the entire system. It was held that though a number of applicant consumers resided in cottages occupied only during a small portion of the year, that service was continually maintained, and therefore it was only fair that a minimum should be collected. The application was granted, provided that consumers not desiring service over a number of months need not pay the minimum by having their meters disconnected. A charge of $1 for reconnecting such meters was established. Application of West Coast Gas Company.

A consumer alleged that the defendant required a deposit of $25 before installing a service connection and meter, and contended that such a charge was unjust and unreasonable and petitioned the commission to compel the defendant to make such installations free of charge. Following the ruling of the Supreme Court of California, it was held that proper authorities have the power to compel utilities to install service connections and meters at their own expense; that the defendant should be required to do so, though owing to circumstances affecting this particular case, certain exceptions were permissible. The defendant was directed to install all meters and service connections at its own expense, excepting that when such connnections were not to be immediately used, a deposit of $15 should be collected, such deposit to be applied to monthly bills when service should have commenced. Belvedere Civic Association v. Janes Company.

The city of Coalinga, Cal., alleged that the rates of the defendant company for gas service in said city were unjust and petitioned the commission to fix reasonable rules therefor. After investigation it appeared that gas consumption in the city had greatly fallen off during the last few years, effected principally by a marked decrease in population, and that the company was receiving not more than 7 per cent. upon its investment, with considerable prospect of a decrease of this amount in the near future. In view of these facts the complaint was dismissed. Coalinga v. Coalinga Gas and Power Company.

MASSACHUSETTS

The town of Reading, Mass., which owns an electric plant which it has operated since 1895, has applied to the State Board of Gas and Electric Light Commissioners for its consent to certain prices for electricity alleged to be less than cost as defined in the Massachusetts statute. That act describes explicitly the method of determining cost. It must include all operating expenses, interest on the plant investment at the rate paid upon the debts incurred therefor, the maturing debt requirements and depreciation reckoned at not less than 3 per cent. upon the cost of the plant; all electricity used by the town must be charged at cost. In applying these requirements to the fixing of a price the legislature apparently intended by the term "cost" the average cost computed upon the total units or kilowatt-hours delivered for all uses. Such interpretation necessarily gives no consideration to any difference in cost, which may exist between customers or groups of customers, growing out of differences in character or conditions of supply. If such differences, which are not uncommon, result in actual and substantial differences in cost, the statutory requirement becomes so entirely arbitrary as to have compelled the legislature to recognize that some departure from the strict interpretation of the rule laid down may be made with advantage to both public and private interests.

The average use of electricity for light is but for a short period of the dark hours of the day; that for power is for a considerable period of the daylight hours. The use of electricity for lighting is, of course, large during the short days and small during the long days of the year, while its use for power is comparatively steady throughout the year. Because of these characteristics, it is generally agreed that, broadly speaking, the unit cost of electricity delivered for power is usually materially less than that delivered for light, and this difference has been made the justification for lower prices for power than for light, notwithstanding the great difficulty, perhaps impossibility, of accurately demonstrating the actual difference in cost for any individual customer. For this reason, and because of the fact that customers for power can readily supply themselves in other ways, power prices have doubtless been often determined by what the manager of a plant thought could be charged and command the business rather than by any very definite analysis of costs. Unless prices thus made are unreasonably low, the increased output secured, if without a corresponding increase of investment, has a tendency to decrease average unit costs, with resulting reductions in prices for light.

NEW BOOKS

1915 Electrical Supply Year Book

In the electrical field it has long been recognized that if the people engaged in the business are ever going to find it reasonably profitable, the cost of operating must be reduced and one of the first places where it has been recognized this cost ought to be reduced, has been in the simplifying of the method of estimating on material and the purchasing and sale of supplies. The task of reducing the manufacturers' lists to a uniform jobbing house list, involved a tremendous amount of work and it has remained for the Western Electric Co. to tackle the job and carry it into successful execution. The trade will find that the compiler has overlooked no point toward making this book easy of reference as well as complete in its listings. The production of this catalogue once again establishes the right of the electrical jobber to a place in the industry. In addition to traveling a force of salesmen, maintaining an adequate stock of goods at convenient distributing centers, carrying the credit risk of the retailer, contractor, and central station, the jobber may be a real constructive force toward the betterment of conditions in the business. Send for a copy.

Automatic Telephony

By Arthur Bessey Smith and Wilson Lee Campbell. McGraw-Hill Book Co., 407 pages, 8 vo. Price, $4.00.

Telephone experts differ as to whether developments in switchboard equipment will ultimately lead to the adoption of full automatic or semi-automatic (automanual) apparatus, but it is rather generally admitted that radical departures will be made during the next few years from the types of manually operated switchboards that are now in general use. The writers of the present work have, therefore, performed a real service in furnishing an up-to-date description of the more important types of automatic and semi-automatic equipment in actual use in this country and abroad. The usefulness of the treatise to the practical telephone man is increased, rather than diminished, by the omission of the usual mass of historical and patent details, and by the confining of the text in the main to a consideration of current practice.

The book is confessedly based in large part upon authoritative descriptions, circuit diagrams, and photographs, furnished by the manufacturers whose apparatus is described. The work of the authors is, however, evident in the careful editing and assembling of the material, and in the text of those chapters that deal with the subject as a whole, particularly those on traffic and development studies.

School of Practical Electricity, Vol I

This is the title of a 410-page book recently published in Milwaukee. Five authors have contributed to this work, the book being divided into the following sections: first principles of electricity, batteries, and low potential electric wiring; theory of direct current; electric light wiring with problems; magnetism and the commercial applications of magnets; and telephony. This manual is so written as to be easily understood by the student, electrician, engineer, architect, or those engaged in professions allied to the electrical industry. Countless diagrams and illustrations are employed to make the text clear. Each section of the book is complete in itself as is indicated by the section on electric light wiring, which has chapters devoted to the following: electric circuits; insulation and capacity of conductors, interior wiring system, how installed; underwriters' restrictions covering all wiring installations; wiring in special locations; fittings and accessories; switches and their connection for control from different locations, three-ways, etc.; practical problems in everyday wiring, wire splicing, etc. Sign lighting; complete wiring of a residence; and electric illumination. The authors of this new book are Oscar Werwath, Geo. J. Kirchgasser, Frederick C. Raeth, W. R. Hennig, and R. A. W. Tamms. The book is published by the Electroforce Publishing Co., Milwaukee, Wis. The sale price is $4.50.

Proceedings of the National Electric Light Association

There have come to us four volumes containing the papers, reports, and discussions at the 37th convention of the National Electric Light Association at Philadelphia in June, 1914. All told, these volumes contain 1,885 pages and nearly 300 illustrations. Among the noteworthy features are two large charts in the volume devoted to technical matters. One of these charts groups and analyzes all the high power transmission systems throughout the world; the other gives various public service commission requirements regarding meters. Both of these charts are invaluable to central station men, and they contain much of interest for all other branches of the industry. Among other features are the Doane report on wiring conditions in Europe, and the address by Chas. P. Steinmetz on electric vehicles. Dugald C. Jackson's paper on "Appraisals of Electric Light and Power Properties" is perhaps the most important contribution to the volume devoted to accounting. The volume containing commercial papers is saturated with the sort of practical information that appeals to the bread and butter side of the central station industry. In the volume devoted to general matters the report of the committee on memorials shows that age is at last beginning to cross the threshold of the electrical industry. During the last year the association lost over two score of its members by death, among them being men of unusual prominence in the electrical field, such as George Westinghouse, Anthony N. Brady, Richard N. Dyer, and Edwin J. Houston. Considering the large amount of detail that must be taken care of in publishing books of this kind, their delivery within five months after the close of the convention, shows the results that can be produced by a competent executive aided by a trained and loyal staff of assistants.

"Analysis of Coal with Phenol as a Solvent," by S. W. Parr and H. F. Hadley, has just been issued as Bulletin No. 76 of the Engineering Experiment Station of the University of Illinois. This bulletin shows that by means of phenol, bituminous coal may be divided into two main portions. A study of each division can therefore be carried on to much better advantage than when in the combined state. In general it has been found that the resinic or pitch-like material is soluble in phenol, that it possesses substantially all of the coke producing ingredients, that oxidation destroys the coking property, that this oxidation occurs slowly at ordinary temperatures and proceeds much more rapidly at 212° F. The insoluble material or cellulose residuum is a more active absorber of oxygen; it has no coking property but resembles the lignitic coals in this respect as also in its avidity for oxygen.

NAVY DEPARTMENT BIDS WANTED

The Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will open bids in the city of Washington on the date specified for the electrical supplies listed below.

Those who wish to submit bids should fill in the special application blanks, which are furnished by the Bureau on request, and should fill in these blanks with the numbers given in the "Sch." column in the list below on which they want to bid.

After having been properly filled out, these blanks should be mailed to the Bureau without delay.

The specifications will then be forwarded, or as soon as they are received from the Public Printer.

These specifications, or schedules, as they are officially called, may be obtained also by applying in the same way to the Navy Pay Office nearest each of the Navy Yards mentioned.

OPENING JANUARY 5, 1915

Article.	Quantity.	Delivery at Navy Yard.	Sch.
Bells and buzzers, watertight	150 bells 12 buzzers	Norfolk, Va.	7708
Cable, telephone	500 feet	Brooklyn, N. Y.	7708
Wire, magnet, cotton and silk covered	Miscellaneous	Philadelphia, Pa.	7708
Wire, magnet, single cotton covered	do	Charleston, S. C.	7708
OPENING, JANUARY 12, 1915			
Cable, interior communication	1,100 feet	Norfolk, Va.	7728
Cord, flexible, for portables	5,000 feet	Philadelphia, Pa.	7735
Wire, lighting and power	2,650 feet	Norfolk, Va.	7728
Wire, single conductor, and rubber covered copper	Miscellaneous	Washington, D. C.	7735

INQUIRIES

Inquiries which we have been unable to answer have been received for the names and addresses of manufacturers of the articles listed below.

Replies from our readers to any or all of these are cordially welcomed both for publication here, and for incorporation as well in our Classified Index of Manufacturers.

In the interests of the good services which this department is expected to render, we would impress upon correspondents the advisability of making their inquiries as specific as possible. This will help materially in obtaining the desired information.

"ABC" National auto horn.
"New Easy" gas burner.
"'Eddy" telephone receiver cord.
"Peerless" expansion bolt.
"Gates" cutout.
"Red-y" wire solder.
"Franklin" arc lamp.
"Vita" electric cooking apparatus.
"No Kair" electric stove.
"Zwicke" insulated wire.
"Bohler" magneto.
"Parmot" moulding.
"Climax" flat iron.
"Severn" gasoline engine.
Address of Try Fireless Cooker Co.
"Eureka" porcelain knob.
"Radio" electric hair waver.
"Rex" two light reflector.
"Utility" lantern.
"Rohne" electric heating pad.

CONSULTING ENGINEERS

Kempster B. Miller, of the firm of McMeen & Miller, consulting engineers, Chicago, has been appointed chief engineer for the receivers of the Central Union Telephone Co. Mr. Miller will continue to make his headquarters at Chicago, devoting only a portion of his time to the affairs of the receivership.

The City Electrical Inspection Department and the insurance companies in Chicago declare that the intense heat created by nitrogen lamps greatly increases the fire hazard.

Harrington, Howard & Ash, Kansas City, Mo., a firm of consulting engineers recently formed, will be engaged in hydroelectric developments, and municipal work. J. L. Harrington was associated for eight years with Waddell & Harrington, a firm of consulting engineers which has recently been dissolved. E. E. Howard has been connected with the latter concern, and L. R. Ash has been city engineer for Kansas City, Mo.

NEW CATALOGUES

United States Glass Co., Pittsburgh, Pa.
Catalogue No. 1. Lighting glassware. 32 pages.

Macallen Company, Boston, Mass.
Bulletin No. 106. Spring fastener for electric fixtures. 8 pages.

Chelten Electric Co., Philadelphia, Pa.
Catalogue for 1915. Electrical Specialties. 40 pages.

Boonton Rubber Mfg. Co., Boonton, N. J.
Catalogue. Molded insulation. 36 pages.

Pittsburgh Electric Specialties Co., Pittsburgh, Pa.
Bulletin. Excess indicator. 4 pages.
Bulletin. Flickering-Dimming excess indicator. 4 pages.

Pass and Seymour, Inc., Solvay, N. Y.
Sheets. Additions to catalogue on wiring devices. 8 pages.

Ward Leonard Electric Co., Bronxville, N. Y.
Bulletins G 8, 9, 10, 11 and 12. Enamelled resistance units.
Circular D 13 and 14. Six inch generator field rheostats.

Neil and Smith Electric Tool Co., Cincinnati, Ohio.
Catalogue No. 4. Portable electrically driven tools. 56 pages.

W. A. Bonnell Co., New York.
Catalogue No. 203. Conduit fittings, cutout and switch cabinets. 48 pages.

Reliance Instrument Co., Chicago, Ill.
Bulletin No. 15. Portable and switchboard instruments. 25 pages.
Bulletin. Instruments for medical profession.

Wagner Electric Mfg. Co., St. Louis, Mo.
Bulletin No. 106. Single phase motors. 12 pages.
Booklet. Moving picture converters.

Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Booklet. New line of magnetic switches. 16 pages.

Williams Articulator Co., Chicago, Ill.
Catalogue. Electrical hearing devices. 46 pages.

Bestlite Company, Newton, Iowa.
Catalogue. Dynamo-battery lighting systems for automobiles. 8 pages.

New England Bolt and Steel Co., Everett, Mass.
Catalogue No. 30. Electrical hardware specialties. 48 pages.

Mechanical Appliance Co., Milwaukee, Wis.
Catalogue. Motor applications. 48 pages.

Moran and Hastings Mfg. Co., Chicago, Ill.
Catalogue No. 34. Gas, electric and combination fixtures, supplement to Catalogue No. 33, from pages 1246 to 1324.

National Acme Mfg. Co., Cleveland, Ohio.
Calendar. Screw machine products.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Ad. Leaflet No. 104. Electrical Christmas goods.

Radio Telephone & Telegraph Co., New York.
Bulletin No. D 14. De Forest Telephone Apparatus. 8 pages.

Manhattan Electrical Supply Co., New York.
Leaflet. Redsealite portable lantern.

E. B. Latham & Co., New York.
Leaflet. Type C promotion fixtures for nitrogen lamps.

Anglo-American Co., Pittsburgh, Pa.
Leaflet. Flashlights, batteries, outfits.

Interstate Electric Co., New Orleans, La.
Booklet. Heated grips for steering wheels of automobiles.

Hotpoint Electric Heating Co., Ontario, Cal.
Broadside. Cooking and heating devices.

Yost Electric Mfg. Co., Toledo, Ohio.
Booklet. Insulating joints. 12 pages.

Bryant Electric Co., Bridgeport, Conn.
Flyer. Dead front distributing panel.

G & W Electric Specialty Co., Chicago, Ill.
Flyer. Distributing devices.

American Electrical Heater Co., Detroit, Mich.
Booklet. Electric cooking and heating devices.

Nungesser Carbon and Battery Co., Cleveland, Ohio.
Card. Symposium on the dry battery.

National X-Ray Reflector Co., Chicago, Ill.
Leaflets. For catalogues C and 17, showing New Comfort lighting fixtures.

Benjamin Electric Mfg. Co., Chicago, Ill.
Bulletin. Type C nitrogen fixtures. 4 pages.

Harvey Hubbell, Inc., Bridgeport, Conn.
Bulletin No. 15-5. Small half reflectors.
Bulletin No. 15-6. Fixture pull switch.
Folder. Reflectors.
Folder. Lamp guards.

Landis Engineering & Mfg. Co., Waynesboro, Pa.
Booklet. Frick electric time and program clock system. 8 pages.

Standard Electric Tool Co., Cincinnati, Ohio.
Folder. Portable electric drills and grinders.
Folder. Portable electric drills.

Edwards & Co., Inc., New York.
Bulletin. Lock gravity semaphore annunciator. 8 pages.

Stow Mfg. Co., Binghamton, N. Y.
Bulletin No. 400. Portable electric tools. 14 pages.

Western Conduit Co., Youngstown, Ohio.
Booklet. Illustrations of some installations.

Delta-Star Electric Co., Chicago, Ill.
Wall card. Reduced prices on S & C fuses.

Wirt Company, Philadelphia, Pa.
Broadside. Dim-a-lites.

P & B Manufacturing Co., Milwaukee, Wis.
Folder. Sun Ray heating pad.

Reynolds Electric Co., Chicago, Ill.
Bulletin No. 201. Alternating current motors. 4 pages

Haag Bros. Co., Peoria, Ill.
Booklet. Royal electric washing machine.

E. S. Strickland, New York.
Leaflet. Electric floor cleaner.

Frank W. Morse. Boston, Mass.
Booklet No. 224. Lamp guards. 12 pages.

D & W Fuse Co., Providence, R. I.
Circular No. 205. Magnetic chucks. 4 pages.

Handy Andy, Chicago, Ill.
Leaflets. Electric lantern attachment.

Electrical Steam Radiator Co., Portland, Me.
Folder. Electrical steam radiator.

Federal Sign System (Electric), Chicago, Ill.
Folder. Porcelain socket and aluminum shadeholder.

J. H. White Mfg. Co., Brooklyn, N. Y.
Leaflet. Hooks for semi-indirect fixtures.

Standard Electric Novelty Co., Chicago, Ill.
Folder. Lamps, flashlights and batteries.

Detroit Fuse & Mfg. Co., Detroit, Mich.
Folder. Indicating enclosed fuse.

NEWLY APPROVED FITTINGS

Auto-Starters

200-250, 220 and 550 volts, up to and including 100 horsepower sizes. Oil-immersed switches, and air cooled transformer windings in metal case. With overload and no voltage release coils. In the "off" position switches disconnect motor and transformer windings from line. Made by Lancashire Dynamo & Motor Co., Ltd., Trafford Park, Manchester, England.

Conduit Outlet Plates

"Union" pressed steel outlet plate. Made by Chicago Fuse Mfg. Co., 1014-1020 W. Congress street, Chicago, Ill.

Fixtures, Studs for

"Macallen" spring fixture fasteners, consisting of stud threaded for fixture stem and fitted on hook attached to spring for drawing fixture tight to wall or ceiling. Non-insulated, Style J. Insulated, Style R. Made by The Macallen Co., Macallen and Foundry streets, Boston, Mass.

Fixtures shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of National Board of Fire Underwriters. Made by Southern Nickel Works, 306 N. Graham street, Richmond, Va.

"Benjamin" reflector fixtures for use with Type C, nitrogen-filled lamps. Standard only when wired with wire having approved slow-burning insulation, or, in case of chain pendants, with approved flexible cord for electric heaters. Made by Benjamin Electric Mfg. Co., 120-128 S. Sangamon street, Chicago, Ill.

Insulating Joints

"Macallen" insulated spring fixture fasteners, consisting of stud threaded for fixture stem and fitted on hook attached to spring for drawing fixture tight to wall or ceiling. Made by The Macallen Co., Macallen and Foundry streets, Boston, Mass.

Lamps, Incandescent, Gas or Vapor

"Cooper Hewitt" photographic apparatus, 28 amperes, 125 volts; 14 amperes, 250 volts; for 2-wire 125 volts, and 3-wire 125-250 volts, direct current or alternating current circuits. Frames with vapor lamp tubes connected to auxiliaries on a main board, either mounted on floor stands or arranged for hanging from ceiling. Note.—The amount of current used by this apparatus makes it necessary to connect it permanently, or by proper approved fittings, to a circuit of suitable capacity. It should never be connected to ordinary lighting circuits, nor to ordinary lamp sockets or receptacles. Made by Cooper Hewitt Electric Co., Eighth and Grand streets, Hoboken N. J.

Switches, Combination Cutout

"M. E. Co." protective service switch boxes and meter boards, 61-100 amperes, 250 volts. Cabinets with meter testing clips and two or three-pole Colonial type fuses. Note.—These devices are not considered suitable for use in connection with secondaries not properly grounded, since they are not so designed that they can be promptly opened by a single operation. Made by Metropolitan Engineering Co., 1238-1252 Atlantic avenue, Brooklyn, N. Y.

Switches, Door

"G. E." 3 amperes, 250 volts, 6 amperes, 125 volts, door switches. Made by General Electric Co., Schenectady, N. Y.

Switches, Push Button Flush

Push button switches shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the Board of Fire Underwriters. Made by Trumbull Electric Mfg. Co., Plainville, Conn.

Switches, Pendant Snap

"Arrow E" single pole, 3 amperes, 125 volts; 1 ampere, 250 volts. Made by The Arrow Electric Co., 103 Hawthorne street, Hartford, Conn.

Switches, Surface Snap

"Arrow E" single pole, 3 amperes, 125 volts; 1 ampere, 250 volts. Made by The Arrow Electric Co., 103 Hawthorne street, Hartford, Conn.

JOVIAN LEAGUES

For the information of Jovians who visit any of the following cities we give below the time and place at which each of the several Luncheon Clubs meet:

AKRON—Monday, 11:30 a. m., Black Whale Inn.

BALTIMORE—Thursday, 12:30 p. m., Emerson Hotel.

BLUEFIELD—Last Saturday of month, 7:30 p. m., Altamont Hotel.

BOISE—Every other Thursday, 12 m., Commercial Club or Owyhee hotel.

BUFFALO—Saturday, 12:30 p. m., Lafayette Hotel.

CALGARY—Twice a month, 12:15 p. m., Cronn's Rathskeller.

CHARLOTTE—First and third Saturday of month, 1 p. m., Gem Cafe.

CHATTANOOGA—Thursday, 12:30 p. m., Read House.

CHICAGO—Monday, 12:15 p. m., Hotel Sherman.

CINCINNATI—Every other Monday, 12:30 p. m., Gibson Hotel.

CLEVELAND—Thursday, 12 m., club rooms, Hollenden Hotel.

COLUMBUS—Every other Thursday, 6 p. m., and 12 m., alternately different hotels.

DALLAS—Monday, 12 m., Oriental Hotel.

DAYTON—First and third Monday of month, 12 m., Dayton Club.

DES MOINES—Saturday 12:30 p. m., Kirkwood and Randolph Hotels, alternately.

DETROIT—First and third Saturday of month, 1 p. m., Hotel Griswold.

DULUTH—Second and fourth Tuesday, 12:15 p. m., St. Louis Hotel.

ERIE—First and third Monday of each month, 6:30 p. m., Reed House.

FORT WAYNE—First Tuesday of month, hour selected, Wayne Hotel.

FORT WORTH—Tuesday, 12:15 p. m., at different cafes.

GALVESTON—Third Monday of each month, Harmony Hall.

HARTFORD—Thursday, 12:30 p. m., Bond's Cafe.

HOUSTON—First and third Thursday of month, 6:30 p. m., Bender Hotel.

HUNTINGTON—Last Friday, each month, Frederick Hotel.

INDIANAPOLIS—Monday, 12:15 p. m., Hotel Severin.

KNOXVILLE—First Tuesday of month, 12 m., Imperial Hotel.

LA CROSSE—Second and Fourth Monday of month, 12 m., Elks' Club.

LETHBRIDGE—Second Thursday of month, 12 m., Hotel Alexandria.

LEXINGTON—First Tuesday after tenth of month, place to be selected.

LOS ANGELES—Wednesday, 12 m., Christopher's, No. 551 S. Broadway.

LOUISVILLE—Every other Monday, 12:30 p. m., different hotels and cafes.

MINNEAPOLIS—Every other Tuesday, 12:15 p. m. and 8 p. m., Dyckman Hotel.

MONTREAL—Monday, 1 p. m., Jovian Club Rooms, 45 Alexander street.

NASHVILLE—First and third Saturday of month, 12:30 p. m., Hermitage Hotel.

NEW CASTLE—Every Wednesday, 12 m., Y. M. C. A.

NEW ORLEANS—Second and Fourth Tuesday, 12:05 p. m., Hotel De Soto.

NEW YORK—Every other Wednesday, 12:30 p. m., Hotel Martinique.

NORFOLK—Fourth Friday of month, 8 p. m., Lorraine and Lynnhaven Hotels.

OKLAHOMA CITY—Friday, 12 m., Skirvin Hotel.

OMAHA—Thursday, 12 m., Omaha Commercial Club.

PEORIA—Every other Saturday, 1 p. m., Jefferson Hotel.

PHILADELPHIA—Thursday, 12:30 p. m., Hotel Adelphia.

PITTSBURGH—Thursday, 12:15 p. m., Fort Pitt Hotel.

PITTSFIELD—First Saturday of each month, 6:30 p. m., Wendell Hotel.

PORTLAND—Thursday, 12:15 p. m., Hazelwood Restaurant.

RICHMOND—Fourth Tuesday each month, 1 p. m., Business Men's Club.

ROCHESTER—Thursday, 12:15 p. m., Chamber of Commerce.

SACRAMENTO—Saturday, 12:30 p. m., Peerless Cafe.

ST. LOUIS—Tuesday, 12:30 p. m., American Hotel Annex, Sixth and Market streets.

ST. PAUL—Every other Tuesday, 12:15 p. m., Emporium Tea Room.

SALT LAKE—Thursday, 12:30 p. m., Commercial Club.

SAN ANTONIO—Wednesday, 12 m., at St. Anthony Hotel, and on second Thursday of each month at 6:45 p. m., at different cafes.

SAN FRANCISCO—Tuesday, 12:15 p. m., Hof Brau Cafe.

SCHENECTADY—Third Wednesday of month, 12:15 p. m., Glenn's Restaurant.

SEATTLE—Friday, 12:30 p. m., Hotel Lincoln.

SIOUX CITY—Thursday, 12 m., different hotels.

SPOKANE—Fourth Tuesday of month, 12 m., East Room, Davenport's.

SPRINGFIELD, OHIO—Last Friday of month, 12 m., Commercial Club.

SYRACUSE—Saturday, 12:15 p. m., Empire Hotel.

TACOMA, WASH.—Tuesday, 12 m., Grill Room, Hotel Olympus.

TOLEDO—Saturday, 12:45 p. m., Commerce Club.

TORONTO—Friday, 1 p. m., Prince George Hotel.

TWIN FALLS—Third Thursday, 7 p. m., Room 5, Power Building.

WACO—Thursdays, 12 m., Riggins Hotel.

WARREN—Second and fourth Friday, 6:30 p. m., at different hotels and cafes.

WASHINGTON, D. C.—Wednesday, 12:30 p. m., Commercial Club.

WINNIPEG—Second Wednesday of month, 12:15 p. m., St. Regis Hotel.

The Commercial Section of the N. E. L. A. is endeavoring to impress on the minds of all central station men that the commercial side of the electrical industry is just as important as any other side, and that the best way for all central station and other commercial men connected with the industry to become acquainted with all that is going on in that branch of the industry, is to join the Commercial Section of the N. E. L. A. Elsewhere in this issue we publish a call to central station men issued by the Commercial Section of which John G. Learned, 72 West Adams street, Chicago, is chairman. "It can be truly said," proclaims Mr. Learned, "that the biggest brains of the electrical industry—your boss included—are keeping the N. E. L. A. going for the sake of you and your fellow employees. Don't forget that!"

The Detroit Board of Commerce is offering a prize of $500 for the best "Made in the U. S. A." trade mark. The trade mark which will be selected in this contest will not be copyrighted, and will have no royalties attached to it. It will be a gift from the Detroit Board of Commerce to everyone who is interested in promoting American prosperity. All designs submitted in the contest must bear the words "Made in Detroit, U. S. A.," and must allow sufficient space for the insertion of any other city in the place of Detroit. The design must be strictly national in character. Further details regarding this contest can be obtained from the secretary of the Detroit Board of Commerce. J. H. Patterson, of the National Cash Register Co.; James Keely, editor of the *Chicago Herald*, and J. C. Leyendecker have been asked to act as judges in this contest.

Jack Shaffer, electrical contractor, has removed from Waldwick, N. J., to Hohokus, N. J. He is putting a stock of hardware in his new shop, and has taken the local agency for the Colonial incandescent lamp, made by the General Electric Co. He has been awarded the contract to wire and equip the new $20,000 house for Dr. H. A. Bonynge in Ridgewood, N. J.

RECENT ELECTRICAL PATENTS

Batteries

1,119,313. *Secondary Galvanic Battery.* Heinrich Paul Rudolf Ludwig Porsck and Julius Adolph Erwin Achenbach, Hamburg, Germany.

1,118,099. *Battery-Charging System.* Clarence E. Beach, Binghamton, N. Y., assignor to George O. Kapp, New York, N. Y.

1,120,077. *Battery-Holder.* George Lewis Patterson, New York, N. Y., assignor to Alice C. Patterson, New York, N. Y.

1,119,024. *Primary Battery.* Homer E. R. Little, New York, N. Y.

Controlling and Regulating Devices

1,120,376. *Alternating-Current-Motor Controller.* William E. Date, Westfield, N. J., assignor to The Cutler-Hammer Mfg. Co., Milwaukee, Wis.

1,118,333. *Electric Regulator.* John L. Creveling, New York, N. Y., assignor to Safety Car Heating & Lighting Co.

1,119,800. *Electric-Current-Controller.* Lynde Bradley, Muskegon, Mich., assignor to Allen-Bradley Co.

1,120,018. *Electric-Current-Controlling Device.* Lynde Bradley, Milwaukee, Wis.

1,119,371. *Electric-Display Control.* Frank C. Reilly, Detroit, Mich.

Electric Switches and Cutouts

1,119,966. *Electric Switch.* Charles J. Klein, Milwaukee, Wis., assignor to The Cutler-Hammer Mfg. Co., Milwaukee, Wis.

1,118,256. *Switch.* Carl J. Anderson, Chicago, Ill., assignor, by mesne assignments, to The Cutler-Hammer Mfg. Co., Milwaukee, Wis.

1,119,209. *Electrical Contact.* Henry J. Wiegand, Milwaukee, Wis.

1,120,382. *Switch.* Bradley Haskins, Milwaukee, Wis., assignor, by mesne assignments, to Allis-Chalmers Manufacturing Co.

1,119,832. *Switching Socket or Connector.* George C. Knauff, Chicago, Ill.

1,118,188. *Electric Switch.* John Desmond, Chicago, Ill., assignor to William S. Potwin, Chicago, Ill.

1,119,527. *Combination Electrical Switch for Automobiles.* George E. Mueller, Chicago, Ill., assignor to Kellogg Switchboard and Supply Co., Chicago, Ill.

1,120,222. *Electrically-Controlled Cut-Out.* Thomas E. Murray and Arthur V. A. McHarg, New York, N. Y.

1,119,864. *Electric Connector.* Edward J. Ovington, Brookline, and John E. Herlihy, Cambridge, Mass., assignors to Simplex Electric Heating Co., Cambridge, Mass.

1,120,364. *Switch-Stand.* Henry E. Billman and Leo R. Mann, St. Louis, Mo.

1,118,024. *Electrical Switch.* John H. Lawrence, Covington, Ky., assignor to Jacob J. Geisen, Covington, Ky.

1,119,461. *Switch Safety Device.* John Sheppard, Durham, N. C., assignor of one-half to Thomas D. Wright and John I. Rose and one-fourth to Ernest A. Seeman, Durham County, N. C.

1,118,324. *Electric Switch.* Herbert Henry Berry and William James Markham, London, England.

1,120,365. *Switch-Stand.* Henry E. Billman and Leo R. Mann, St. Louis, Mo.

Generators, Motors, and Converters

1,118,174. *Alternating-Current Generator.* Harold De Forest Arnold, East Orange, N. J., assignor to Western Electric Co., New York, N. Y.

1,118,296. *Accelerating Device for Alternating-Current Motors.* William D. Lutz, Allendale Borough, N. J., assignor to Otis Elevator Co., Jersey City, N. J.

1,119,105. *Magneto-Generator.* Thomas W. Morgan, Waterloo, Iowa, assignor to Wilbur W. Marsh, Waterloo, Iowa.

1,119,387. *Electric Motor.* Fred Baker, Downers Grove, Ill.

Heating Devices

1,120,003. *Electric Heater.* Alonzo A. Warner, New Britain, Conn., assignor to Landers, Frary & Clark, New Britain, Conn.

1,118,392. *Electric Cooking Device.* Henry Price Ball, Pittsfield, Mass., assignor to General Electric Co.

1,119,840. *Electrical Fluid Heater.* Frank Kuhn, Detroit, Mich.

1,119,336. *Electrical Heating Unit.* Frank Wylde Ball, Melbourne, Victoria, Australia.

1,118,320. *Electric Water-Heating Faucet.* Ernest C. Webster, East Oakland, Cal., assignor of one-half to Henry Gruenhagen, East Oakland, Cal.

1,118,454. *Electric Cooking Apparatus.* Harry G. Weeks, Chicago, Ill., assignor to Frederick C. Austin, Chicago, Ill.

1,118,872. *Electric Iron.* William S. Lyle, Jr., San Francisco, Cal.

1,119,838. *Electrical Heating Unit.* Frank Kuhn, Detroit, Mich.

1,118,380. *Vapor Electric Device.* William E. Story, Jr., Schenectady, N. Y., assignor to General Electric Co.

1,119,190. *Thermostat.* George J. Ogden, Toronto, Ontario, Canada.

1,118,763. *Electric Stove.* Walter V. Hardy, Indianola, Miss.

1,119,841. *Electrical Heater.* Frank Kuhn, Detroit, Mich.

Lighting Devices

1,118,203. *Standard for Electric Lamps.* Walter O. Holt, Providence, R. I., assignor to Livermore and Knight Co., Providence, R. I.

1,118,402. *Electric Incandescent Lamp.* Friedrich Dickenschied, Berlin, Germany, assignor to General Electric Co.

1,120,226. *Electric Fuse.* Thomas Edward Murray, Jr., Brooklyn, N. Y.

1,119,050. *Incandescent-Electric-Lamp Fixture.* Elda G. Smith and John J. Dossert, Syracuse, N. Y., assignors to Crouse-Hinds Co., Syracuse, N. Y.

1,120,160. *Hanger for Arc-Lamps.* Charles E. Pope and Ross S. Phillips, Cleveland, Ohio.

1,118,414. *Flame Arc-Lamp.* Cromwell A. B. Halvorson, Jr., Saugus, Mass., assignor to General Electric Co.

1,118,464. *Arc-Lamp Electrode.* Malcolm H. Baker, Boston, Mass., assignor to American Flaming Arc Lamp Co.

1,120,086. *Arc-Lamp.* Alvah C. Roebuck, Chicago, Ill., assignor to The Enterprise Optical Mfg. Co., Chicago, Ill.

1,120,001. *Electric Lamp for Vehicles.* Knight H. Thompson, Shelby, Ohio, assignor to David W. Cummins, Shelby, Ohio.

1,120,221. *Electric Fuse.* Thomas E. Murray, New York, N. Y.

1,119,926. *Electric Fuse-Igniter.* Sherman Clark, Cottage Grove, Ore.

1,120,110. *Incandescent-Electric-Lamp Socket.* August Weber, Jr., Schenectady, N. Y., assignor to Weber Electric Co.

1,118,623. *Electric-Lamp Socket.* Reuben B. Benjamin, Chicago, Ill., assignor to Benjamin Electric Mfg. Co., Chicago, Ill.

1,119,663. *Electric Pocket-Lamp.* Joseph G. Swallow, New York, N. Y.

1,118,765. *Electrical Sign.* Truman S. Hastings, Detroit, Mich.

1,118,684. *Electric-Arc Lamp.* Mark A. Ross, Chicago, Ill.

Measuring and Recording Instruments

1,120,217. *Electrical Measuring Instrument.* Frederick W. Morris, Brooklyn, N. Y., assignor to Thomas E. Murray, New York, N. Y.

1,118,717. *Electric Indicator.* Joseph W. Wiley and John A. Kropp, Oak Park, Ill.

1,120,241. *Electric Time Mechanism.* Samuel G. Rhodes, New York, N. Y., assignor to Thomas E. Murray, New York, N. Y.

1,118,678. *Electrical Measuring Instrument.* Joshua Patrick, Detroit, Mich.

Processes and Miscellaneous Devices

1,120,301. *Distributer for Electrical Ignition Systems for Internal-Combustion Engines.* Eugene Gassmann, Brooklyn, N. Y., assignor to Eisemann Magneto Co., Brooklyn, N. Y.

1,118,064. *Electric Protection System.* William M. Scott, Radnor, Pa.

1,118,827. *Electrical Fitting.* George B. Thomas, Bridgeport, Conn., assignor to The Bryant Electric Co., Bridgeport, Conn.

1,118,905. *Seal for Vapor Electric Apparatus.* Roy D. Mailey, Lynn, Mass., assignor to Arthur A. Noyes, trustee, Boston, Mass.

1,119,872. *Electrode-Holder.* Hillard J. Potts, Kansas City, Mo.

1,119,701. *Electric Imprinter.* Frederick Hyder, Pittsfield, Mass.

1,118,422. *Electric Master-Clock.* Asmus Jabs, Zurich, Switzerland.

WANTS—FOR SALE—AGENTS

SUPERINTENDENT FOR LIGHT AND WATER PLANT at Palmyra, Mo. State experience and salary wanted in first letter. Address J. M. Sosey, Palmyra, Mo.

DIRECTORY OF MANUFACTURERS

ALPHABETICAL AND CLASSIFIED INDEX

A. A. Wire Co., Newark, N. J.
Ab Auto Lites auto lamps: Adams Bagnall Elec. Co., Cleveland, O.
Abacot lightning arrester: Lord Mfg. Co., Brooklyn, N. Y.
A. B. C. chain: Am. Ball Chain Wks., 12 Wooster, New York.
A. B. C. hanger: Fee & Mason, New York.
A. B. C. magneto: Marine Launch I. Co., Watkins, N. Y.
A. B. C. charging plug: Albert & J. M. Anderson Mfg. Co., Boston.
A. B. C. Spring Co., New York, N. Y.
Abeles & Taussig, St. Louis, Mo.
Abell pump: Standard Thermometer Co., Boston.
Abestine Stone Co., Boston, Mass.
A-Best-O sad irons: Dover Mfg. Co., Canal Dover, O.
A. B. Mfg. Co., Poughkeepsie, N. Y.
Able Elevator Co., Louisville, Ky.
Abolites fix: Adams-Bagnall El. Co., Cleveland, Ohio.
Absher Co., W. M., No. Wilkesboro, N. C.
Acetylene Lighters, see Lighters.
A. C. horn: Russell El. Co., Danbury, Ct.
Ackley Brake & Supply Co., New York.
Acme annunciator: Moon Mfg. Co., Chicago, Ill.
Acme Asbestos Covering & Supply Co., Chicago.
Acme bell: Ansonia (Conn.) Elec'l Co.
Acme box: H. Krantz Mfg. Co., Brooklyn, N. Y.
Acme bush: Thomson-Bonney Co., B'klyn.
Acme Cabinet Co., New York, N. Y.
Acme connector: Reliable Electric Co., Chicago, Ill.
Acme Egg Tester Co., Louisville, Ky.
Acme Electric Heater Co., Detroit, Mich.
Acme extinguisher: Missouri Lamp & Mfg. Co., St. Louis, Mo.
Acme fan: Dilg Mfg. & Trading Co., New York.
Acme Gas & El. Fix. Co., New York.
Acme Metel Goods Mfg. Co., New York.
Acme Metal Mfg. Co., Chicago, Ill.
Acme Rapid Fire bat.: Nungesser Carbon & Battery Co., Cleveland, Ohio.
Acme shade hold: Am. Brass & Copper Co., New York & Waterbury Mfg. Co., Waterbury, Conn.
Acme tape: General Electric Co., Schenectady, N. Y.
Acme resist. wire: G. Nash Co., N. Y.
Acme Wire Co., New Haven, Conn.
Acorn switch: Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Acousticon hearing device: General Acoustic Co., New York, N. Y.
Ad-a-link bracket: National Office Appliance Co., Camden, N. J.
Adams Bagnall Electric Co., Cleveland, O.
Adams Bros. Mfg. Co., Pittsburgh, Pa.
Adam Electric Co., Frank, St. Louis, Mo.
Adams Mfg. Co., H. E., Pittsburgh, Pa.
Adams-Morgan Co., Up. Montclair, N. J.
Adams I. v. trans: Haas El. & Mfg. Co., Springfield, Ill.
Adams & Westlake Co., Chicago, Ill.

ADAPTERS, Auto Lamp.

Auto Oil Lamp Converters or Brackets.
GENERAL ELECTRIC CO., Schenectady, N. Y.
HOWARD MINIATURE LAMP CO., Ampere, N. J., "Snap-on."
HUBBELL, INC., HARVEY, Bridgeport, Conn., "Dazlite."
MANHATTAN ELEC'L SUPPLY CO., 17 Park place, New York.
METAL SPECIALTIES MFG. CO., 738 W. Monroe st., Chicago, Ill., "Gil-Bo."
MORSE, FRANK W., Boston, Mass., "Electrofler."
PLUME & ATWOOD MFG. CO., Waterbury, Conn.
ROSEN & CO., A. W., 610 Broadway, New York, N. Y.

Black Mfg. Co., Fort Wayne, Ind.
Campbell Co., A. S., Boston, "Cello."
Castle Lamp Co., Amesbury, Mass.
Chicago Electric Mfg. Co., Chicago.
Cole & Co., Henry, Boston, Mass.
Gray & Davis, Cambridge, Mass.
Horn & Brannen Mfg. Co., Phila.
Standard Elec. Novelty Co., Chicago.

ADAPTERS, Lamp.

Tungsten Adapters.
Socket Adapters & Extensions.
ARROW ELECTRI CCO., Hartford, Ct.
BENJAMIN ELECTRIC MFG. CO., 120 So. Sangamon st., Chicago, Ill. (Tungsten Adapters).
BRYANT ELEC. CO., Bridgeport, Conn. (Candelabra).
GENERAL ELECTRIC CO., Schenectady, N. Y., "Ediswan."
HUBBELL, INC., HARVEY, Bridgeport, Conn.
WHITE MFG. CO., J. H., 111 N. 3d st., Brooklyn, N. Y. (Tungsten).
Advance Mfg. Co., Pittsburgh, Pa.
Erikson Elec. Co., L., Boston, Mass. (Tungsten Adjustable Joint).
Federal Sign System (Elec.), Chicago.
Phila. Elec'l & Mfg. Co., Phila., Pa.
Westinghouse Lamp Co., New York.

Adapti Mfg. Co., Cleveland, O.
Adaptibox: Adapti Mfg. Co., Cleveland.
Add Water battery: Burns-Boston Battery & Mfg. Wks., Boston, Mass.
Addie tester: El. Spec. Co., Cresco, Ia.
Ad Electric System Co., Dayton, Ohio.
Adjustable Brackets. See Fixtures, Adjustable.
Adjustable Fixture Co., Milwaukee, Wis.
Adjustable Fixtures. See Fixtures, Adjustable.
Adjustable Light Holder Co., Newark, N. J.
Adjustaphone brackets & tele: Chicago Writing Mach. Co., Galesburg, Ill.
Adjustarod guy rod: Crouse-Hinds Co., Syracuse, N. Y.

ADJUSTERS, Cord & Lamp.

AMERICAN VULCANIZED FIBRE CO., 500 Equitable Bldg., Wilmington, Del., "Q. & C."
ARROW ELEC. CO., Hartford, Conn., "Dow."
AUSTIN & CO., M. B., 700 Jackson blvd., Chicago, Ill., "Gem."
CONDIT ELECTRICAL MFG. CO., Boston, Mass., "Saca."
DIAMOND STATE FIBRE CO., Bridgeport, Pa.
McGILL MFG. CO., 39 Oak st., Valparaiso, Ind., "Innovate."
MATTHEWS & BRO., W. N., 3705 Forest Park blvd., St. Louis, Mo., "Easy."
MORSE, FRANK W., Boston, Mass. ("Handy" Cord and "Webster" Lamp Adjuster).
PHELPS MFG. CO., Detroit, Mich. ("Any Angle" Lamp Fixture).
TRUMBULL ELECTRIC MFG. CO., Plainville, Conn.
YOST ELEC. MFG. CO., Toledo, O. ("Electrogrip" Lamp Adjuster).

Advance Mfg. Co., Pittsburgh, Pa., "Heinz."
American Enamel Co., Providence.
Bates, H. A., Garwood, N. J., "Slip-on."
Carter & Co., J. W., Abilene, Texas, "Eclipse."
Cohn, Adolph, West Hoboken, N. J., "Rela."
C. & D. Mfg. Co., Dayton, O.
Electric Specialty Mfg. Co., Pittsburgh, Pa., "King."
Estes & Sons, E. E., New York (Wood).
Gam Mfg. Co., Lancaster, Pa.
Gund Mfg. Co., La Crosse, Wis., "Two Ball."
Hagstrom Bros. Mfg. Co., Lindsborg, Kan. (Push Button).
Harter Specialty Co., Waukegan, Ill.
Johnny Co., Greenville, O.
Lorentz, Henry E., Baltimore, Md.
Milam & Son, B. C., Frankfort, Ky.
Novelty Turning Co., Norway, Me.
Reel Adjustable Fixture Co., Chicago.
Runzel-Lenz Electric Mfg. Co., Chicago, Ill. ("R-L" Telephone Switchboard Cord Length Adjuster).
Stewart Elec. Co., F. H., Phila., Pa.

ADJUSTERS, Switchplate.

Elec. Apparatus Co., Chicago, Ill.

Adjusters, Socket Chain. See Attachments, Socket.
Adjusto ground clamp: S. Robt. Schwartz & Bro., New York.
Adjusto light: Joseph A. Kramer & Co., Chicago, Ill.
Adlake lamp & outfit: Adams & Westlake Co., Chicago, Ill.
Adlite shade: Harter Mfg. Co., 1136 W. Austin ave., Chicago, Ill.
Adriance Mfg. Co., Brooklyn, N. Y.
Adt Co., John B., Baltimore, Md.
Advance gas ltg. burner: Samson Elec. Co., Canton, Mass.
Advance clamp: G. Heinemann & Co., Philadelphia, Pa.
Advance Electric Co., St. Louis, Mo.
Advance freezer: V. Clad & Sons, Phila.
Advance inst: Eldredge Elec. Mfg. Co., 93 P. O. Square, Springfield, Mass.
Advance Lumber Co., Cleveland, O.
Advance Mach. Co., Toledo, O.
Advance Mfg. Co., Kalamazoo, Mich.
Advance Mfg. Co., Pittsburgh, Pa.
Advance Pump & Compressor Co., Battle Creek, Mich.
Advance wire: Driver-Harris Wire Co., Harrison, N. J.
Advertising Devices. See Fixtures.
Advertogram Co., Chicago, Ill.
Aerco aeroplane: A. E. Rittenhouse Co., Honeoye Falls, N. Y.
Aerial Conduit Co., Wabash, Ind.
Aermotor Co., Chicago, Ill.
Aero Fire Alarm Co., New York, N. Y.
Aero messenger car: Fairmount Elec. & Mfg. Co., Philadelphia, Pa.
Aetna Elec. Co., Div. of Franklin Elec. Mfg. Co., Hartford, Conn.
Aetna insulation: A. & J. M. Anderson Mfg. Co., Boston, Mass.
Aetna Powder Co., Chicago, Ill.
Aetna Rubber Co., Cleveland, O.
A. G. Elec. & Mfg. Co., Seattle, Wash.
A. G. E. arma. mach.: Amer. Gen. Engrg. Co., New York, N. Y.

AGENTS, Manufacturers.

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Agens & Hopper, Newark, N. J.
Ahlstrom exp. bolt: Stewart & Romaine Mfg. Co., Phila., Pa.
Aiken Co., Herrick, Lawrence, Mass.
Ajax Battery Co., Chicago, Ill.
Ajax drier: Central Tele. & Elec. Co., 310 No. 11th st., St. Louis, Mo.
Ajax Elec. & Mfg. Co., Boston, Mass.
Ajax expansion and toggle bolts: Chicago Nut Co., Chicago, Ill.
Ajax fire alarm: J. H. Bunnell & Co., 32 Park pl., New York, N. Y.
Ajax light fixture: Line Material Co., So. Milwaukee, Wis.
Ajax paint: Sherwin-Williams Co., Cleveland, O.
Ajax toy motor: Kendrick & Davis, Lebanon, N. H.
Alabaster Bowls. See Bowls.
Aladdin dry battery: Beacon Min. Elec. Co., 118 Duane st., New York.
Aladdin Elec. Co., Chicago, Ill.
Aladdin lighting torch: Universal Nov. Co., New York, N. Y.
Alamo Mfg. Co., Hillsdale, Mich.
Alan Wood Iron & Steel Co., Phila., Pa.
Alarms, Burglar. See Burglar Alarms, also Annunciators; also Springs.
Alarms, Fire. See Fire Alarms.

ALARMS, Tank.

IRISH ELECTRIC CO., 35 E. 19th st., New York, "Shamrock."
OSTRANDER & CO., W. R., 22 Dey st., New York, N. Y., "Neu."
STANLEY & PATTERSON, 23 Murray st., New York, N. Y., "Patterson."
WALDMAN, JOHN J., 136 Liberty st., New York, N. Y.

Alba carbon: L. E. Frorup & Co., N. Y.
Alba shade and fixtures: Macbeth-Evans Glass Co., Pittsburgh, Pa.
Albedoglas shade: Gleason-Tiebout Glass Co., Brooklyn, N. Y.
Alberger Pump & Condenser Co., N. Y.
Albright Ignition Co., Columbus, Ga.
Albro-Clem Elevator Co., Phila., Pa.
Alco: Amer. Lava Co., Chattanooga.
Alco clothes washer: Altorfer Bros. Co., Dept. 9012, Roanoke & Peoria, Ill.
Alexalite Co., New York, N. Y.
Alexander arc lamp: Radio Elec. Co., New York.
Alexander Mfg. Co., J., New York.
Alexapope Mfg. Co., Brooklyn, N. Y.
Allen-Bradley Co., Milwaukee, Wis.
Allen, Charles E., Pequabuck, Conn.
Allen Co., L. B., 4550 No. Lincoln st., Chicago, Ill.
Allen Mfg. Co., Hartford, Conn.
Allen Randall bolt clipper: H. K. Porter, 6 Ashland, Everett, Mass.
Allen Sparks Gas Lt. Co., Lansing, Mich.
Alley, F. R., Seattle, Wash.
Alliance Rubber Co., Alliance, O.
Alliance Spec. Mfg. Co., Lakewood, O.
Alligator connector: Fairmount Elec. & Mfg. Co., Philadelphia, Pa.
Alligator-Jaw connector: Albert & J. M. Anderson, Brookline, Mass.
All-in-one spark plug: Frontier Specialty Co., Buffalo, N. Y.
All-in-one clamp: Fairmount Elec. & Mfg. Co., Philadelphia, Pa.
Allis-Chalmers Mfg. Co., Milwaukee.
Allison Co., W. D., Indianapolis, Ind.
Allsteelequip Co., Aurora, Ill.
All-Ways desk light: Amer. Elec. Co., Chicago, Ill.
Almond Mfg. Co., Ashburnham, Mass.
Alpha auto lamp: Badger Brass Co., Kenosha, Wis.
Alpha Elec. Co., 116 W. 29th st., New York, N. Y.
Alpha Lamp Co., Inc., Harrison, N. J.
Alpha-Bet sign: Chicago Min. Lamp Wks., Chicago, Ill.
Alphaduct Co., 134 Cator ave., Jersey City, N. J.
Alter Light Co., 827 S. Loomis st., Chicago, Ill.
Altick tele. booth: Fold. Cab. Co., Lancaster, Pa.
Altizer Elevator Co., Chicago, Ill.
Altman & Co., Chicago, Ill.
Altofer Bros. Co., Dept. 9012, Roanoke and Peoria, Ill.
Alumaduct conduit: Nat. Enamel. & Mfg. Co., Youngstown, O.
Aluminum Co. of Am., Pittsburgh, Pa.
Aluminum fuses: See fuses, Open Link.

ALUMINUM.

ALUMINUM CO. OF AMERICA, Pittsburgh, Pa.
Elec. Smelting & Aluminum Co., Lockport, N. Y.
So. Aluminum Co., Whitney, N. C.

Always Reliable furnace: O. Bernz, Newark, N. J.
A-M shade holder: Art Metal Mfg. Co., Cleveland, O.
Amboy Works, New York, N. Y.
Am. Arc Lamp Co., Kalamozoo, Mich.
Am. Aristotype Co., Jamestown, N. Y.
Am. Art Glass Co., New York, N. Y.
Am. Art Glass Co., Camden, N. J.
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Am. Battery Co., 1162 Fulton, Chicago.
Am. Bead Co., New York.
Am. Beauty sad iron: Am. Elec'l Heater Co., Detroit, Mich.
Am. Beauty tel: Am. Elec. Co., Chicago.
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Am. Bridge Co., New York.
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Am. Conduit Mfg. Co., Keystone Bldg., Pittsburgh, Pa.
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Am. Elec. Co., Chicago, Ill.
Am. El. Lamp Division of G. E. Co., Central Falls, R. I.
Am. Elec. Mach. Co., New York, N. Y.
Am. Elec. Mch. & Elevator Co., St. Louis, Mo.
Am. Elec. Tool Co., Petersburg, Va.
Am. Elec. Tool Co., West Newton, Mass.
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Am. Elec'l Wks., Phillipsdale, R. I.
Am. Elevator Co., New York, N. Y.
Am. Elevator & Machine Co., Louisville, Ky.
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Am. Ever Ready Wks. of Nat'l Carbon Co., New York, N. Y.
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Am. Fix. & Mfg. Co., Troy, O.
Am. Floor Surf. Mach. Co., Toledo, O.
Am. Gen. Engrg. Co., New York.
Am. Grip comealongs: M. Klein & Sons, Chicago, Ill.
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Am. Insulating Machy. Co., N. E. Cor. Fairhill & Huntington sts., Philadelphia, Pa.
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Am. Lava Co., Chattanooga, Tenn.
Am. Mfg. Co., Grottoes, Va.
Am. Mfg. Co., Minneapolis, Minn.
Am. Mfg. Co., Meriden, Conn.
Am. Metal Wks., Phila., Pa.
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Am. Metal Moulding Co., Newark, N. J.
Am. Mica Co., Newton Lower Falls, Mass.
Am. Model & Inst. Co., Worcester, Mass.
Am. Oil & Supply Co., Newark, N. J.
Am. Ozone Co., Buffalo, N. Y.
Am. ozonizers: Birtman Elec. Co., Chicago, Ill.
Am. Paring Mach. Co., Phila., Pa.
Am. Perforator Co., Chicago, Ill.
Am. Pin Co., Waterbury, Conn.
Am. Platinum Wks., Newark, N. J.
Am. Porcelain Co., E. Liverpool, O.
Am. Publicity Co., Worcester, Mass.
Am. Pulley Co., Phila., Pa.
Am. Radiator Co., Chicago, Ill.
Am. Radium flashlight: Am. Carbon & Battery Co., East St. Louis, Ill.
Am. Ry. Supply Co., New York, N. Y.
Am. Reflector & Ltg. Co., Chicago, Ill.
Am. Rolling Mill Co., Middletown, O.
Am. Rotary Valve Co., Chicago, Ill.
Am. Screw Co., Providence, R. I.
Am. Seal Co., Bridgeport, Conn.
Am. Sewer Pipe Co., Akron, O.
Am. Shearer Mfg. Co., Nashua, N. H.
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Am. Sign Co., Kalamazoo, Mich.
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Am. Steel & Wire Co., Chicago, Ill.
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Am. Storage Battery Co., Cambridge, Mass.
Am. Tele. Fire Alarm Co., Chicago.
Am. Transformer Co., Newark, N. J.
Am. trolley pole catcher: Trolley Supply Co., Canton, O.
Am. Tube Wks., Boston, Mass.
Am. Tube & Stamping Co., Bridgeport, Conn.
Am. Vitrified Conduit Co., New York.
Am. Vulcanized Fibre Co., 500 Equitable Bldg., Wilmington, Del.
Am. Washer Co., St. Louis, Mo.
Am. Watchmen's Time Detector Co., New York.
Am. Woodenware Mfg. Co., Toledo, O.
Am. Wood Preserving Co., Chicago, Ill.
Am. Wood Working Co., Chicago, Ill.
Am. X-Ray Equipment Co., New York.
Americanite wire: Amer. Elec'l Wks., Phillipsdale, R. I.
Americore wire: American Steel & Wire Co., Chicago, Ill.
Ames Shovel & Tool Co., North Easton, Mass.
Amidon tools: Bergman Tool Co., Buffalo, N. Y.
Ammeters. See Instruments.
Ampere Hour Meter. See Instruments, Indicating.
Ampvo Battery Co., Chicago, Ill.
Ampro bell: Francis Keil & Son., New York, N. Y.
Ancapco wire: American Brass Co., Waterbury, Conn.
Anchor Edi-Swan auto connector: Metal Specialties Mfg. Co., 736 W. Monroe st., Chicago, Ill.
Anchor Rods. See Anchors, Guy.
Anchor, Screw. See Bolts, Expansion.
Anchor Webbing Co., Woonsocket, R. I.

ANCHORS, Guy, also Rods.

CROUSE-HINDS CO., Syracuse, N. Y., "Harpoon," "Adjustarod."
ELECTRIC OPERATIONS CO., Bush Terminal, Brooklyn, N. Y.
LANTZ & SONS, M., Pittsburgh, Pa.

Electrical Record

Established 1892

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Vol. XVII NEW YORK, FEBRUARY, 1915 No. 2

The most important event in electrical circles in recent years was the opening of the trans-continental telephone line on January 25. That day, heretofore set aside as the birthday of Burns, Scotland's greatest lyric poet, was celebrated, unconsciously perhaps, by having a Scot in New York send the first official telephone message over the new trans-continental line to another Scot in San Francisco. Alexander Graham Bell, in New York, the inventor of the telephone, repeated to Thomas A. Watson, in San Francisco, his handy man of forty years ago, the first message ever sent over a telephone, the instruments being replicas of those used in Boston in June, 1875. Forty years ago, Bell said over a line 40 feet long: "Mr. Watson, please come here, I want you." Presumably Watson was on hand a second or two later. On January 25, 1915, Watson's reply to Bell was: "All right, but it will take me a week to get to you." In forty years' time, in the lifetime of both principals, the radius of telephone service had extended from 40 feet to 3400 miles!

With characteristic Yankee ingenuity and thrift, a company supplying water to a large New England city seeks to turn waste energy into revenue by making the flow of water for domestic purposes produce electricity for light, heat, and power. The story, told in this issue, pictures the ingenious means adopted for harnessing this waste. The thrift appears when it is realized that the value of water in a water supply system for electricity making purposes is only a small fraction of the value of the water for domestic purposes.

It is reported that the income of some of the electric utilities on the Pacific Coast is being affected adversely by the operation of "Jitney" busses. The inroads these pirate conveyances are making is due to something akin to special privilege, as they appear now to be operating without the restrictions imposed on the electrical utilities by the controlling public service commission.

A few years ago, during the transition from carbon to tungsten filament lamps, the fragile tungsten filament was guarded against rupture by a large variety of shock absorbers devised for that purpose. These shock absorbers disappeared when tungsten filaments of a non-fragile nature came into the market. A problem of an entirely different kind now comes into being with the development and use of the nitrogen-filled lamp. This lamp, it seems, produces so much heat that the ordinary lamp fittings are unsuited to it, and new fittings are therefore being devised to meet the new conditions. Judging by the past, it is safe to predict that changes in the lamp itself will call for a further change in fittings. Thus change follows change, and the ingenuity of our manufacturers is continually being taxed to adapt their products to meet the needs of the day. Ingenuity and adaptability are bywords in the electrical industry.

The industry will note with more than ordinary interest the provisional report on plugs and receptacles published elsewhere in this issue. This report is the result of two years of painstaking effort on the part of a committee appointed by the National Electric Light Association to standardize plugs and receptacles so that current consuming household devices could be used on receptacles installed for that purpose as well as on lamp sockets. As shown in the report, the committee has confined its efforts to plugs and receptacles for use in lighting circuits only, the line being drawn at 660 watts, or, what is the same thing, devices taking 6 amperes at a pressure of 110 volts. The committee urges that its recommendations be adopted so that in time the large variety of plugs and receptacles now on the market will finally give way to types as standard as the present type of screw lamp base and socket.

Jobbers and contractors will hear with interest that one of the large jobbing houses has just brought out a first edition of an electrical supply year book. This book will hereafter be issued regularly on the first of every year. With this book before him a contractor who has to estimate on a job will not be compelled to refer to one price list and then carry in his mind one string of discounts for wire, another for porcelain, and another for fixtures. He can open at any selected page, apply a uniform discount, and arrive at a price which he can safely figure represents his cost.

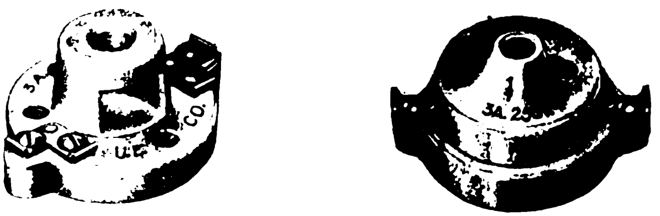
The practical stoppage in the supply of chemicals from Germany has increased the price of all commodities in which these chemicals are used. Among the chemicals affected are those that go to make up dry batteries. As a result of this shortage, coupled with the exporting of large quantities of sheet zinc for use abroad, there has been a general advance of 10 per cent. in the price of dry batteries. The ingredients of dry batteries are carbon, zinc, sal ammoniac and manganese dioxide. The zinc is going out; carbon, sal ammoniac and manganese have ceased to come in; hence the increase in price.

NEW PRODUCTS

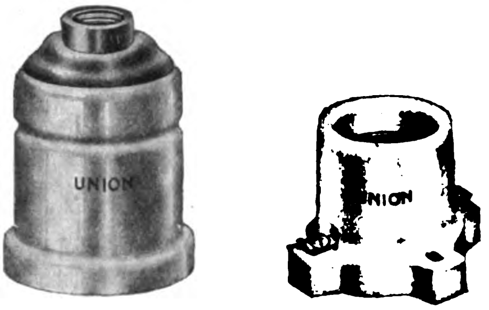
THIS DEPARTMENT IS DEVOTED EXCLUSIVELY TO NEW GOODS, AND IS A COMPLETE MONTHLY RECORD OF PROGRESS

Union Rosettes, Mogul Adapter, Mogul Sockets and Receptacles

Contractors will be interested in the new line of rosettes, designs of which are shown in the accompanying illustrations. They have just been placed on the market by the Union Electric Co., Trenton, N. J.


One and two piece rosettes. Union Electric Co., Trenton, N. J.

This company will shortly have on the market an adapter that converts the standard Edison socket to the mogul sign. This will permit the use of the large base nitrogen-filled lamps, by simply screwing the adapter in the socket.


Mogul socket and receptacle. Union Electric Co., Trenton, N. J.

The accompanying cuts show a new line of mogul sockets and receptacles that will also shortly be placed on the market by this concern. Particular attention is called to the fact that the body of the socket is identical with that of the receptacle—the socket cap being interchangeable with the receptacle base—this being a most convenient feature. Sockets are made in two sizes, ⅜ in. and ½ in. They can be furnished with concealed or cleat porcelain wall bases.

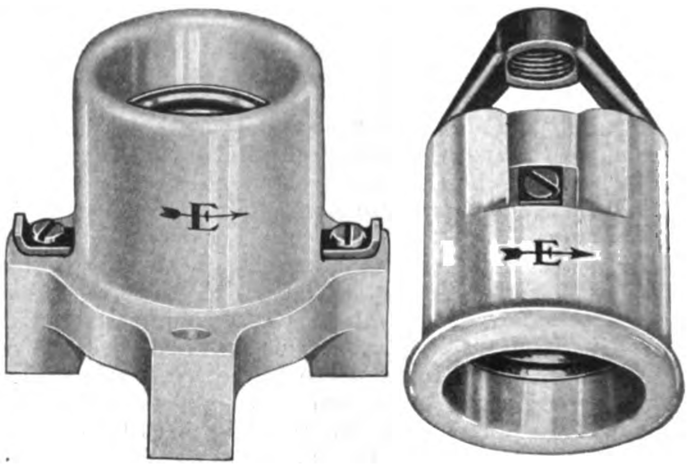
Mogul adapter. Union Electric Co., Trenton, N. J.

Other new electrical fittings will soon be put on the market by this company. We shall describe them in a future issue.

Arrow Mogul Socket and Receptacle

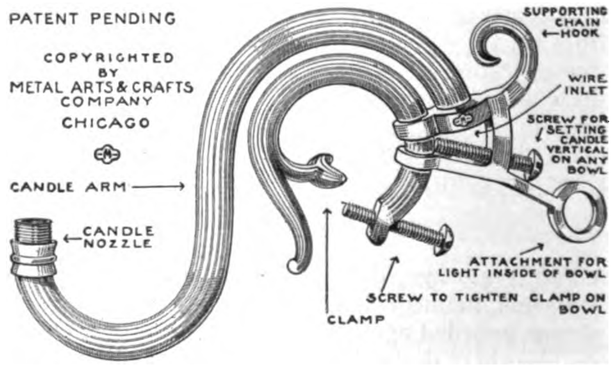
A new socket and receptacle for mogul base lamps are shown in the accompanying illustrations. The socket with yoke is of the same overall length as the brass shell mogul sockets already on the market, and can be used with fixtures already designed for these brass shell sockets.

The receptacle shown here is adapted for exposed wiring, and is so designed that the porcelain lugs projecting below the bottom surface of the receptacle allow an air space between the receptacle and the surface to which it is attached. Both of these devices are particularly adapted for use with the new Type "C" high-efficiency lamps. They are manufactured by The Arrow Electric Co., Hartford, Conn.


Mogul socket and receptacle. Arrow Electric Co., Hartford, Conn.

Metal Arts and Crafts Candle Clamp

Provision is now made for the use of electric candles on the outer edge of semi-indirect bowls by a candle clamp offered by the Metal Arts & Crafts Co., 617 West Jackson boulevard, Chicago.

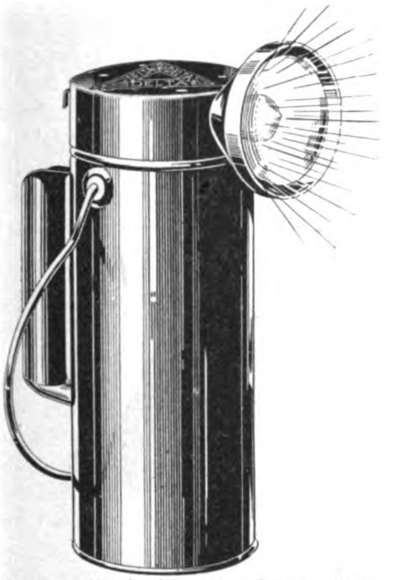

PATENT PENDING
COPYRIGHTED BY METAL ARTS & CRAFTS COMPANY CHICAGO
CANDLE ARM
CANDLE NOZZLE
SUPPORTING CHAIN HOOK
WIRE INLET
SCREW FOR SETTING CANDLE VERTICAL ON ANY BOWL
ATTACHMENT FOR LIGHT INSIDE OF BOWL
SCREW TO TIGHTEN CLAMP ON BOWL
CLAMP
Fixture candle clamp. Metal Arts & Crafts Co., 617 West Jackson boulevard, Chicago, Ill.

This device consists of a clamp proper, of circular ribbed form, with a three-point outside bearing and an intermediate tightening screw to set on the inside of the glass bowl, thus obtaining a ridged position; and an adjusting attachment to slide on the clamp, embodying a supporting chain hook, a wire inlet for the candle arm, an extended ring eyelet for supporting an electric light inside the bowl, and a set screw to secure the arm to the clamp in a position to make the candle stand vertical. The arm shown in the cut is made in the candle clamp, though other shapes can be furnished if required special. This device is intended to hold an electric candle on the outer edge of any hemisphere or squat shaped semi-indirect bowl.

Delta Hand Lamp Reflector

The Delta Electric Co., Marion, Ind., is marketing a new reflector for use with the Delta electric hand lamp.

With the lamp stationed 200 feet away, it is claimed, a newspaper can easily be read. At a distance of 400 feet, the bright glare from the light appears almost as intense as a powerful automobile headlight. The electrical energy is furnished by the ordinary type of dry battery.



Electric hand lamp equipped with new reflector. Delta Electric Co., Marion, Ind.

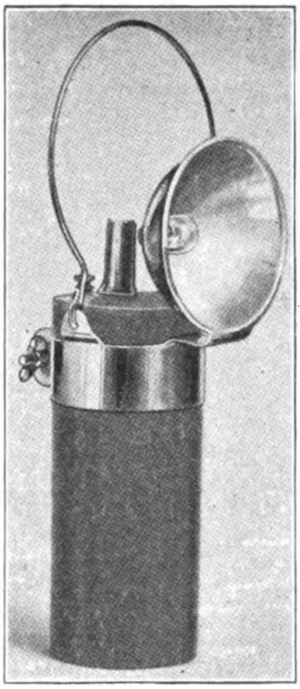
Hirsch Electric Safety Hand Lamp

The Hirsch Electric Mine Lamp Co., 314 North 12th street, Philadelphia, Pa., is offering the trade the electric lamp shown in the accompanying cut. Equipped with a storage battery it weighs but 2 lb., and will burn 12 hours. The maker says it is adaptable for use in every industry, but is especially designed for use by watchmen, inspectors, fire patrols, and rescue corps.

Safety hand lamp. Hirsch Electric Mine Lamp Co., 314 North 12th street, Philadelphia, Pa.

Simplex Electric Lantern

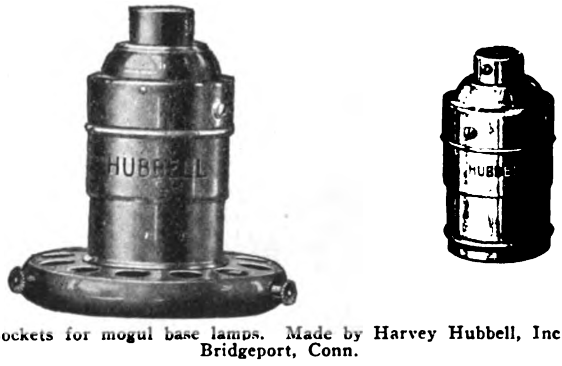
As shown in the annexed cut, this form of electric lantern consists of a dry battery, a mazda bulb, a patented reflector, and a combination carrying contact making and gripping attachment. The makers claim that it is the simplest hand lantern thus far put on the market, and that it will burn for hours under water. It is made by The Stelling Mfg. Co., 829 Grand avenue, Port Washington, Wisconsin. The lighting attachment is made in one piece and can be adjusted so as to fit snugly any make of dry battery.



Simplex electric lantern. The Stelling Mfg. Co., 829 Grand avenue, Port Washington, Wis.

Hubbell Sockets for Mogul Base Lamps

Harvey Hubbell, Inc., Bridgeport, Conn., is in the market with two new kinds of sockets for mogul base lamps. Both kinds are represented by the accompanying illustrations. As shown, one is without a shade holder, while the other has a 3¼-inch shade holder permanently attached. The shell and cap are fastened together by means of a screw thread, and held in place by a steel set screw. The standard finish of these sockets is brush brass.



Sockets for mogul base lamps. Made by Harvey Hubbell, Inc., Bridgeport, Conn.

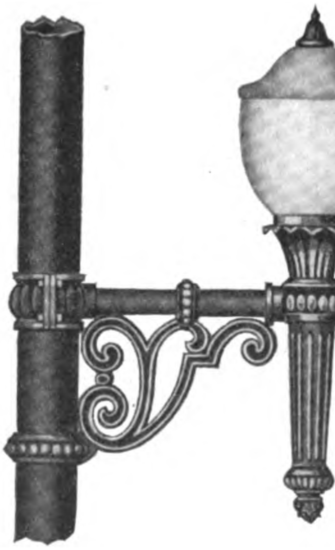
Nobolux Ceiling Bowls

The annexed cut shows one of a new line of nitrogen lamp fixtures now being marketed by the Lensed Electric Shade Co.,, 101 Warren street, New York. These fixtures have been fired at extremely high temperatures, and are warranted to withstand without injury all the heat to which any nitrogen lamp is likely to subject them. The combination shown in the cut is for use with 400, 500, 730, and 1000-watt nitrogen lamps, or for 400-500-watt tungstens. The present line includes bowls 8, 10, and 12 inches in diameter.

Nobolux ceiling bowl. Lensed Electric Shade Co., 101 Warren street, New York.

Nitrogen Lamp Bracket

A bracket designed especially for supporting the new Type C high efficiency nitrogen lamp has recently been put on the market by the Electric Railway Equipment Co., Cincinnati, Ohio. A cut of this bracket is shown herewith. It is made in two styles. Either style can be arranged to take lamps of this kind in multiple, series, or compensator. A method of mounting the socket allows it to be adjusted for height so that any size type C lamp can be used. This arrangement permits the filament of the lamp to be located in the center of the outer globe. This company is also making street standards to accommodate nitrogen filled lamps. The height, design of column, dimensions of the base, and kind of glass where used, are all provided for. Details may be obtained from the new catalogue on these fixtures which the company has just issued.



Bracket for nitrogen lamp. Electric Railway Equipment Co., Cincinnati, Ohio.

The accompanying cut shows bracket No. 10292 attached to a street railway pole. Brackets and bases can be furnished to fit any size of pole.

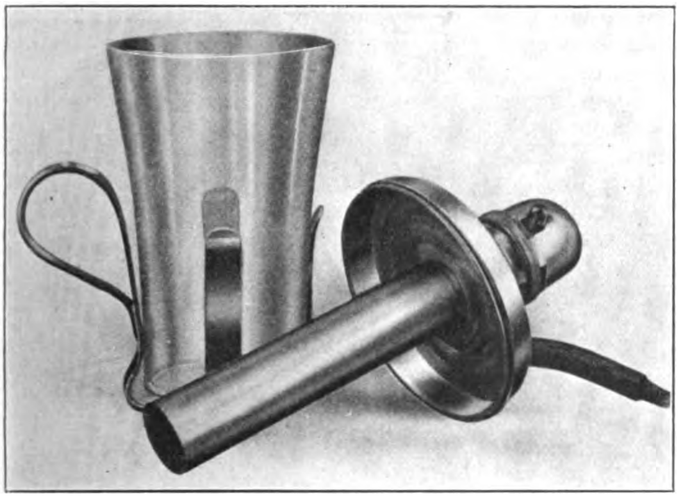
Vanitie Portable Lamp

This new portable lamp, now offered to the trade, has many novel features. A felt-lined spring clamp on the base allows the lamp to be fastened to the head of a bed, a table, or chair, without marring the finish. A rubber suction cup, concealed within the base, fastens the lamp to any smooth non-porous surface. An automatic release destroys the vacuum instantly. A ball joint, allowing free movement in every direction, is so constructed that the insulation is protected at all times, and as the lamp is movable rotatably, this joint is practically universal. Ten feet of parallel cord wind inside the base so that there will be no slack when the entire length is not in use. The bell-shaped shade can be tilted to any angle, allowing control of the reflection. It is constructed of brass throughout and finished in old brass and nickel plate. The height is 12 inches, weight about 1½ lb. It can be taken apart and easily packed for traveling. It is manufactured by the Aladdin Lamp Corporation, 111 Broadway, New York.

Vanitie portable lamp. Aladdin Lamp Corporation, 111 Broadway, New York.

One-Minute Water Heater

A small electric water heater that heats a glass of water in a minute has been developed and placed on the market by the Pittsburgh Electric Specialties Co., 927 French street, Pittsburgh, Pa. The heating element is embedded in a cylinder 15/16 inch in diameter and 4½ inches long, which is surmounted by a metal top large enough to cover the glass vessel and terminates in a switch. The feed wire is introduced through the top. This top serves to keep out dirt and facilitates the heating process. The other parts are a glass vessel for the water and a metal holder.

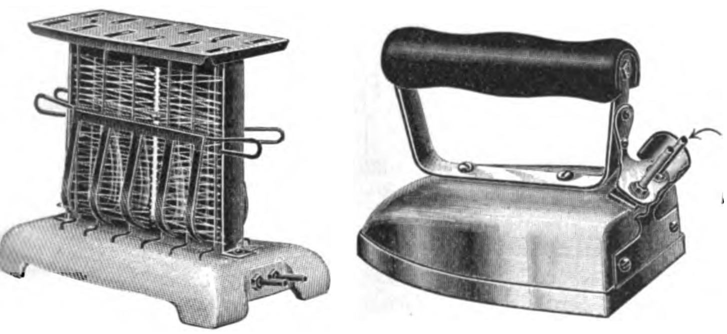


One-minute water heater. Pittsburgh Electric Specialties Co., 927 French street, Pittsburgh, Pa.

The features are quick heating, and quick cooling of the heating element. It will boil water in a minute and a half, and the heating element may be removed from the glass as soon as rapid boiling ceases, without danger of burning the fingers. The heater serves equally well as a small sterilizer for dentists and for domestic use. The current consumption is 450 watts.

Wicks Toaster and Sadiron

These two current consuming devices have just been put on the market by The Wicks Electric Co., 1384 East 40th street, S. E. Cleveland, Ohio. In the sadiron the heating element is wound on end embedded in a special composition. It is guaranteed to last for a lifetime. It consumes 550 watts, taking 5 amperes at 110 volts' pressure. Patented air-cooled pins are said to prevent cord and plug trouble. The pins are supported from the handle instead of being mounted directly on the body of the iron.



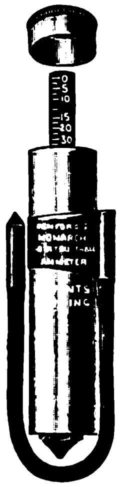
Toaster and sadiron. Wicks Electric Co., 1384 East 40th street, S. E., Cleveland, Ohio.

The toaster is made with a white porcelain base, the metal parts being of sheet-steel nickle plated. The heating element, which is wound for 110 volts, 5 amperes, is so constructed as to distribute a quick, uniform heat to the bread and warming rack on top.

During the recent cold wave in Cleveland, several enterprising dealers kept their show windows clear of frost by operating the electric toaster made by The Wicks Electric Co., of that city.

Monarch Indestructible Ammeter

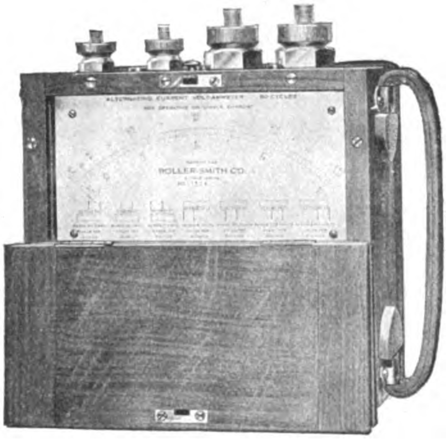
A handy ammeter for testing dry batteries and other sources of electrical energy of comparatively small capacity has recently been developed by the Benford Mfg. Co., Mt. Vernon, N. Y. The accompanying cut shows what it looks like. Unlike ordinary ammeters, say the makers, this instrument can be handled without gloves—it can even be used as a sinker for fishing, provided the cap is on firmly. To use this instrument, remove the cap and apply the terminals to the terminals of the battery; then the protruding tongue gives the rate of current flow in amperes up to the maximum of the instrument, which is 30. It can be carried in the vest pocket for convenience.



Monarch indestructible ammeter. Benford Mfg. Co., Mt. Vernon, N. Y.

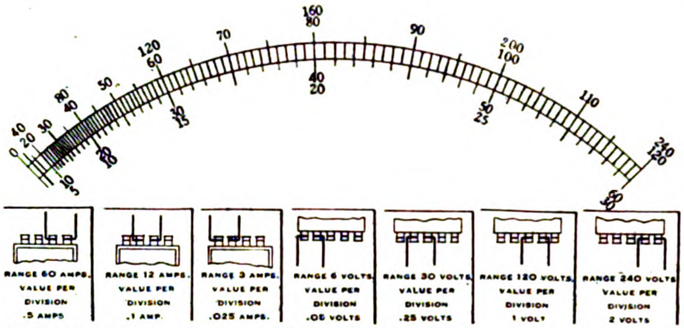
Roller-Smith Signal System Alternating Testing Voltammeter

The Roller-Smith Co., 203 Broadway, New York, has just brought out a new type of alternating portable signal system testing voltammeter. The annexed illustrations show the instrument itself and a full size replica of the operating scale. This instrument is designed to meet the demand for one instrument to replace the varied assortment of ammeters and voltmeters hereto-



Alternating portable signal system testing voltammeter. Roller-Smith Co., 203 Broadway, New York.

fore included in a testing outfit. The case is of oak and is provided with a leather handle, hinged cover, and snap catch. The binding posts are sturdy and have non-removable tops. Each post is marked with a numeral corresponding to the scale value which is obtained when that binding post is used. The instrument also carries a zero adjuster conveniently placed.

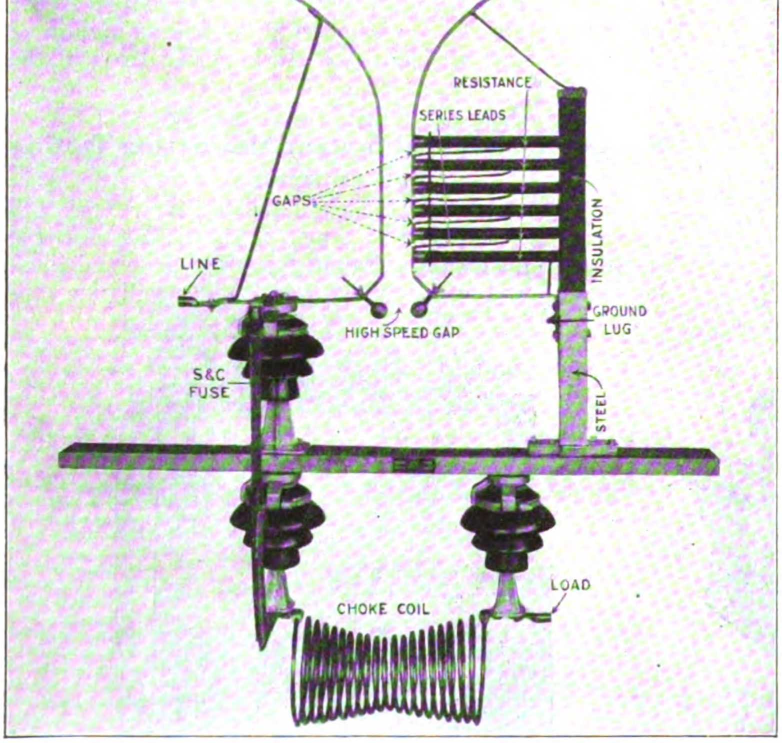

RANGE 60 AMPS. VALUE PER DIVISION .5 AMPS
RANGE 12 AMPS. VALUE PER DIVISION .1 AMP.
RANGE 3 AMPS. VALUE PER DIVISION .025 AMPS.
RANGE 6 VOLTS. VALUE PER DIVISION .05 VOLTS
RANGE 30 VOLTS. VALUE PER DIVISION .25 VOLTS
RANGE 120 VOLTS. VALUE PER DIVISION 1 VOLT
RANGE 240 VOLTS VALUE PER DIVISION 2 VOLTS

Scale showing range of portable alternating testing voltammeter, also diagrams of connections. Roller-Smith Co., 203 Broadway, New York.

The lower part of the scale cut contains indicating diagrams showing the proper connections for the various ranges. These instruments operate only on alternating current and are calibrated for the frequency on which they are to be used. The weight is 7 lb., and the dimensions, 6⅞ by 7 by 4¼ inches.

Delta-Star Outdoor Sub-Station Switching and Protective Units

The successful commercial operation of low cost, medium capacity, high tension outdoor sub-stations has developed a demand for higher capacity equipment which can be operated without daily attendance. To meet these conditions, the complete fusing and lightning arrester unit, shown herewith, has been developed—three units constituting a three-phase equipment.



High-speed sphere gap lightning arrester. Delta-Star Electric Co., 617 West Jackson boulevard, Chicago, Ill.

The S & C lightning arrester employed with these sub-station units consists of two discharge horns, one of which is solid, insulated and adjustable, the other sectionalized and fixed in position. The lower section of the fixed horn is mounted on a steel ground post, an insulating section supporting tubes containing non-inductive resistance. To the outer ends of the insulating tubes and resistances are secured copper segments of the discharge horn—a small air gap being left between each segment. The resistances are connected in series, the steps being graded in value.

Lightning and static disturbances of high frequency are rapidly discharged across the high-speed sphere gap. This gap, having no series resistance, furnishes a free discharge path to earth, rapidly draining static.

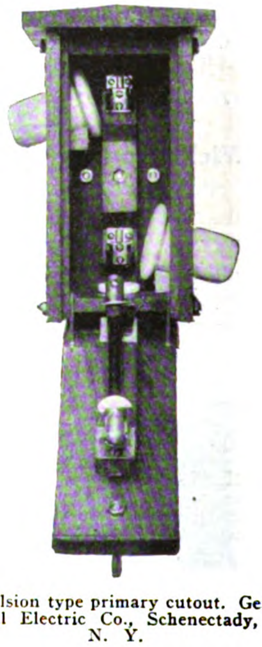
The above equipment, known as the type "SE," is being marketed by the Delta-Star Electric Co., 617 West Jackson boulevard, Chicago, Ill.

General Electric Primary Cutouts

A new line of expulsion type primary cutouts of improved design has been developed by the General Electric Co., Schenectady, N. Y., for outdoor use. They have standard ratings of 15 amperes, 6600 volts, 75 amperes, 6600 volts, or 100 amperes, 2500 volts.

The main feature of the design is the safety afforded the operator in re-fusing the cutout. When the door is opened, the fuse holder is automatically disconnected from the circuit. The ring bolt and latch, with which the door is fitted, are well separated from all live metal parts, so that it is safe to handle. The details are shown in the annexed cut.

On the bottom of the box is an indicator in the form of a brass card receiver placed over the gas outlet of the expulsion fuse. Into this receiver can be slipped a white card, a square of oiled paper or a very thin sheet of white celluloid, forming a white target against the black background of the box that can be readily seen from the ground.

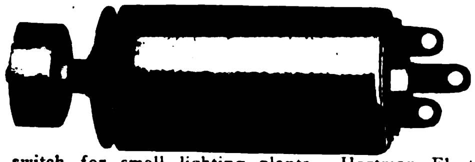


Expulsion type primary cutout. General Electric Co., Schenectady, N. Y.

The blowing of the fuse causes a discharge of gas from the end, which dislodges the card from its receiver. This feature obviates the necessity of climbing the pole to ascertain the condition of the fuse.

Hartman Automatic Switch

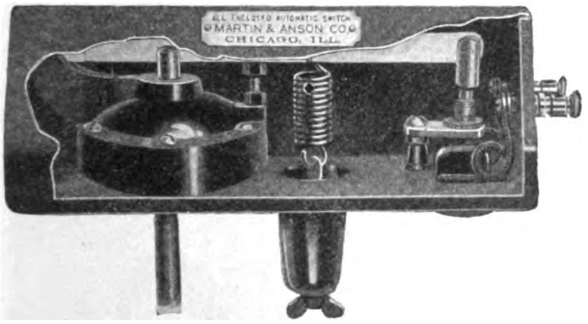
This device is intended for use on low voltage isolated lighting plant switchboards in connection with the usual 16-cell storage battery outfit. Properly termed, it is an automatic cut-in and cut-out switch. It is connected in between generator and battery and automatically cuts in or connects generator with line when the voltage generated reaches a pre-determined value, usually 38 volts. In the same way it automatically cuts out or breaks the circuit when the battery voltage exceeds that of the generator, or, in other words, when there is a reversal of current. The makers say it renders unnecessary all hand manipulation of switches, as it can be depended upon to perform its functions automatically. The moving contact is in the form of a disc, which is cupped and slotted so as to insure a tight, even contact at every point. The form of contact used and the further fact that the disc is weighted, prevents "freezing" or sticking and consequent burning of contact points. It opens instantly on small reverse current. The switch is made in three capacities, viz.: 15, 30, and 60 amperes for 32-42 volts. It is made by the Hartman Electrical Mfg. Co., Mansfield, Ohio.



Automatic switch for small lighting plants. Hartman Electrical Mfg. Co., Mansfield, Ohio.

Automatic Pressure Controlling Switch

The all-enclosed automatic switch, manufactured by Martin & Anson Co., 2226 Indiana avenue, Chicago, is a device for automatically controlling the amount of pressure or vacuum developed by electric air or water pumps. The moving parts are all enclosed, thus guarding the switch from accidental injury or tampering. The electrical contact mechanism has a positive action, insuring a quick make and break.



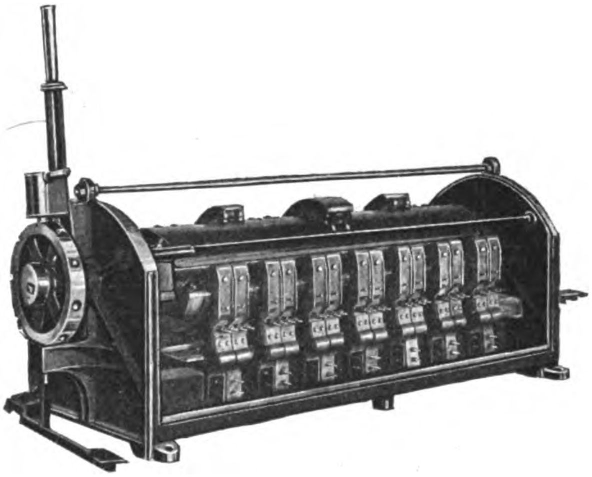
Automatic pressure controlling switch. Martin & Anson Co., 2226 Indiana avenue, Chicago, Ill.

This switch is made up in a number of sizes, according to the horsepower of the motors driving the pumps, and the pressures developed. It forms a complete starter for most small outfits. Practically every range of pressure or vacuum is obtainable.

Drum Controller

The controller illustrated is probably the largest drum controller that has ever been built and was furnished by the Industrial Controller Co., formerly the Independent Electric Mfg. Co., of Milwaukee, for use in connection with an electric steel melting plant. This drum controller is 8 feet, 5 inches long by 3 feet high, and weighs approximately 5000 pounds.

It is impossible for a man to turn the cylinder of this drum by means of a standard drum handle, and a special ratchet arrangement was built for operating the cylinder.



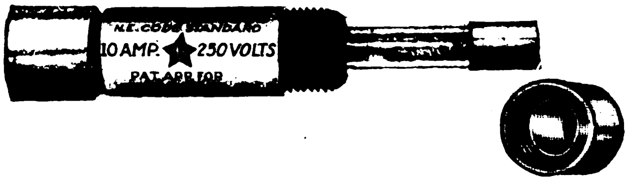
Drum controller. Made by Industrial Controller Co., Milwaukee, Wis.

The fingers of this drum are of cast copper, having removable tips and each of the 28 fingers weighs 16 pounds.

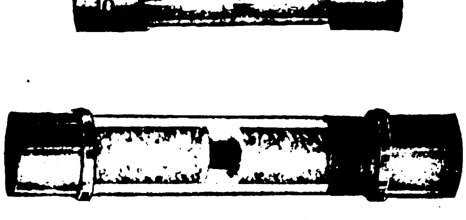
Star Refillable Fuse

The Star Fuse Co., Inc., 448 Broome street, New York City, is now marketing a refillable fuse that is said to have the approval of both the National Board of Fire Underwriters and the New York City Department of Water Supply, Gas and Electricity. While it is primarily a standard cartridge fuse, the fuse element is a complete fuse within itself, making it possible when a fuse blows readily to replace the part destroyed and save the outer brass caps and fibre shell. This is said to be the first fuse of this type that has met with the approval of the National Board of Fire Underwriters.

Knife blade type of refillable fuse.



Ferrule type of refillable fuse.



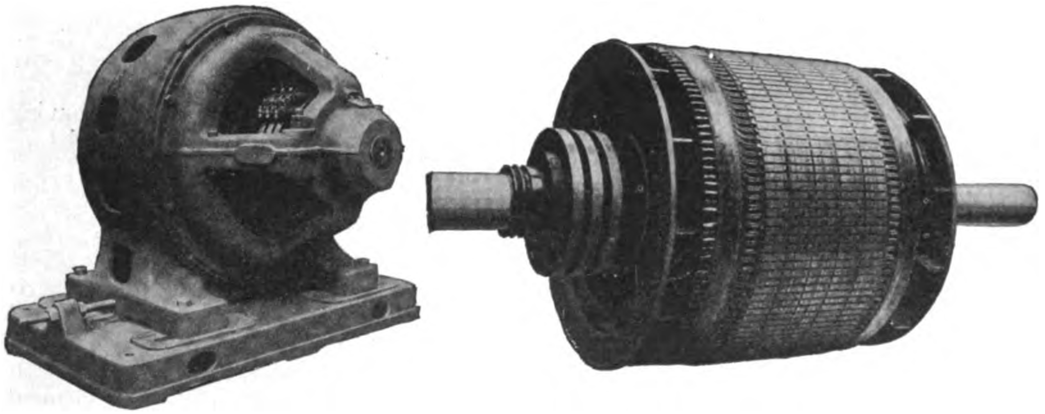
Renewable elements of refillable fuse.

Star renewable cartridge fuse. Star Fuse Co., Inc., 448 Broome street, New York.

The refillable element itself is made up of an inner cartridge consisting of a strip of fuse wire wrapped in two sheets of asbestos and enclosed in a glass tube having brass end caps. The fuse wire is soldered to these end caps, the caps themselves being cemented to the glass. A window is left in the asbestos coverings so that the condition of the fuse may be noted at any time. This inner cartridge is inserted in a holder made up of a fibre tube with brass caps threaded on each end. Inside of each of these brass caps is a clip with a split frame that holds the refillable fuse firmly in place. Both the refillable fuse cartridge and the fuse receptacle which contain it are thoroughly ventilated to allow the escape of gases formed when the fuse blows.

Westinghouse Induction Motor

A new line of large slip-ring induction motors for continuous service has recently been brought out by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. A characteristic of these motors is great strength. The frame is massive, the bearings and shaft extra large, and the windings are securely braced against vibration. The bearings are dustproof and rest on three machined seats, a construction that has been found to be the best practice in steel mill service.



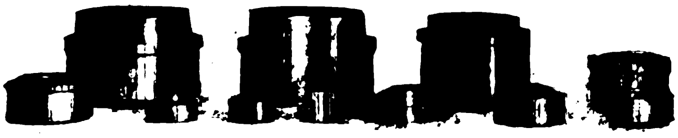
New induction motor. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Also enlarged view of rotor.

All coils are form wound and completely insulated to ground before being placed in the slots. The stator slots are straight open; those of the rotor have an overhanging lip which assists in holding the coils in place. If necessary, the coils can be removed and replaced without bending as readily as with straight open slots. The shaft can be removed without disturbing the rotor winding.

Bakelite Commutator Construction

The Diehl Mfg. Co., of Elizabeth, N. J., is placing on the market a new and improved type of commutator in which Bakelite is used and is being manufactured under patent rights granted to the above firm by the patentee.

Bakelite is a synthetic chemical compound, white and flakey in its raw state, but when subjected to great heat and pressure becomes exceedingly hard, having unusual mechanical and dielectric strength.



Commutator of Bakelite. Diehl Mfg. Co., Elizabeth, N. J.

Commutators manufactured by the patented process use bars of approximately the same shape as when constructed with mica rings. High peripheral speeds may be attained by commutators when this method of construction is used. Mica of standard quality is used between the bars, but Bakelite fills up all space between bars and bushing and eliminates all chance of short circuits or grounds.

Bakelite is proof against moisture and acid and is not affected by expansion or contraction due to rise and fall of temperature. As a synthetic insulator this compound occupies an important place in the industry.

Emerson 9-Inch Oscillating Fan

The Emerson Electric Mfg. Co., 2024 Washington avenue, St. Louis, Mo., is offering the trade the brand new 1915 fan motor shown in the accompanying cut. It is a 9-inch oscillator, and represents a marked departure in such apparatus. It is operated by an induction type motor without brushes or commutator and runs at a speed of about 1550 revolutions per minute. This company is also marketing a 9-inch direct current oscillator, operated by a brush type motor. The blades are of Parker design and are said to give a much more satisfactory volume of air than the ordinary 8-inch blade fan motor heretofore in general use. The induction type 9-inch fan weighs 13 lb. and can easily be moved about the house. It is practically noiseless, even at high speed. It requires 35 watts at full speed and correspondingly reduced consumption on lower speeds.

All parts of the oscillator mechanism are removable from the outside of the motor with no other tool than a common screwdriver. A five-year factory guarantee coupon is furnished with each of these fans, also a 10-foot cord and plug, and a can of oil.

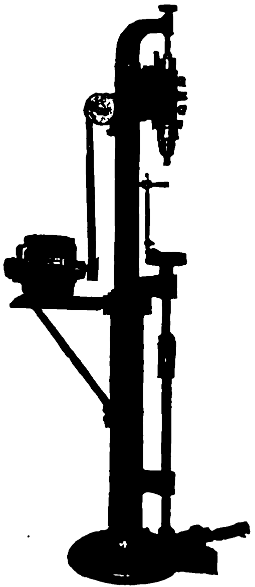
New 9-inch oscillating fan. Emerson Electric Mfg. Co., 2024 Washington avenue, St. Louis, Mo.

Simplex Protective Stopper Spinning Machine

The demand for bottles of the non-refillable type has led to the development of the machine illustrated herewith, which is used for spinning simplex protective stoppers into the neck of bottles.

These stoppers consist of a copper cage which is heavily silverplated and which carries a plated ball about 3/8 inch in diameter.

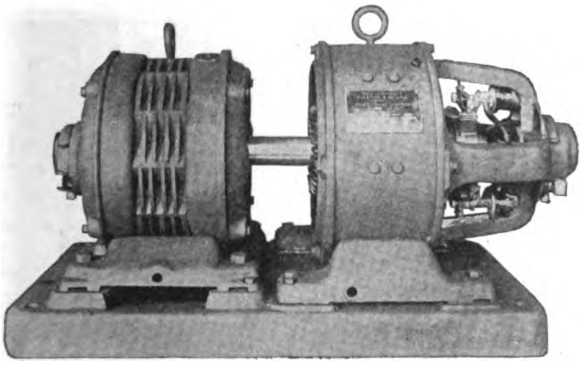
The bottle is placed on the stand which is raised to meet the spindle which spins the stopper into the grooves in the neck of the bottle. When spun in place it is impossible to remove this stopper without destroying the bottle and the bottle becomes practically non-refillable. Experiments under the most favorable conditions in a laboratory demonstrated that over one-half hour was required to fill one of these protected bottles by the vacuum process.


Machine for inserting corks in bottles. Simplex Protective Stopper Co., Baltimore, Md. Operated by Robbins & Myers motor.

The machines are driven by ¼ and 1/6 horsepower, direct and alternating current motors manufactured by The Robbins & Myers Co., Springfield, Ohio. The spinning machine and stoppers are manufactured by the Simplex Protective Stopper Co., Baltimore, Md.

Westinghouse Motor-Generator Sets for Motion Picture Machines

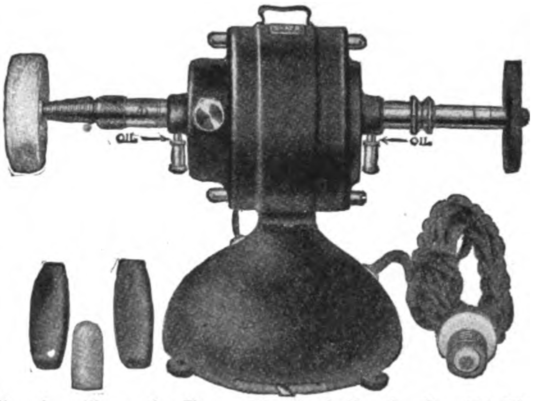
The motor-generator set shown below consists simply of a motor driven by the alternating current received from the power lines and driving a generator which supplies direct current of the proper voltage for the arc. This set is especially designed for motion picture service. It is made by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. The generator has a high overload capacity and is so wound that it gives and delivers a potential of 75 volts at all loads, instead of allowing the voltage to drop as the load is increased as is usual with generators. These characteristics are of value because they enable the set to operate two moving picture machines at once (one projecting and the other "warming up") without interfering with the picture being shown or altering the speed of the machine if motor-driven. Thus continuous picture service can be obtained from one set.


Motion picture motor-generator set. Westinghouse Electric Mfg. Co., East Pittsburgh, Pa.

Seventy-five volts were selected as standard because the arc requires about 50 volts, and experience shows that the most stable arc is obtained when about 25 volts is absorbed in ballast resistance.

Knapp General Utility Tool

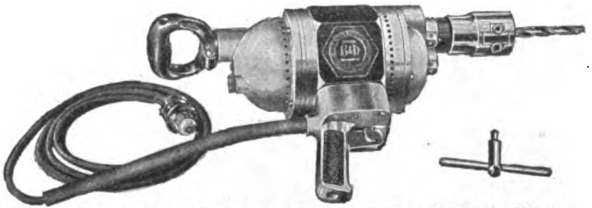
The accompanying cut shows a motor driven general utility tool now being marketed by the Knapp Electric & Novelty Co., 509 West 51st street, New York. It can be used for polishing, grinding, and driving small mechanical devices.



Electric utility tool. Knapp Electric & Novelty Co., 509 West 51st street, New York.

Portable Electric Drill

The drill illustrated herewith is suitable for all drilling services where a revolving tool can be used. The design is such as to make it especially convenient for drilling in corners or up close to obstructions. It is made by The Black & Decker Mfg. Co., Baltimore, Md.


Portable electric drill with hair trigger control. Black & Decker Mfg. Co., Baltimore, Md. Operated by Robbins & Myers universal motor.

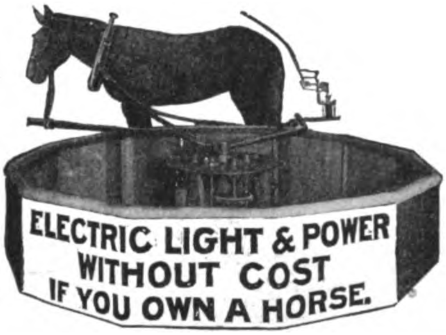
The control is similar to that of an automatic pistol. One finger does the work and consequently the grip on the outfit and the aim is not obstructed in operating the control. This prevents breakage of drills and enables the operator to drill more accurately than he can with a tool when it is necessary to release his grip to turn the switch, or press a button to control the drill.

The motor, of Robbins & Myers make, is universal and operates on both direct and alternating current, 110 or 220 volts.

Electric Horsepower Machine

A practical machine for producing electricity in places where electric service is not to be had has just been put on the market by the Electric Horsepower Co., 906 Elm street, Cincinnati, Ohio. It is designed for use by any one who owns a horse that is idle six or more hours a week. As shown in the cut, the motive power is a horse walking in a 14 foot circle at a rate of about 2 miles an hour. Should the horse be inclined to loiter an electric bell rings as a warning to him, and if he doesn't liven his gait an electrically operated whip comes into action to urge him on.

This outfit includes a 40-volt direct current generator, with a capacity of thirty 16 candle-power mazda lamps. Used in connection with a storage battery, this device will furnish electric service for any of the ordinary household or farm purposes. The capacity of the battery furnished is 60 amperes, and when charged it contains enough energy to burn a 16-candle-power mazda lamp three hours per day for 40 days, or five 16-candle-power mazda lamps three hours per day for 8 days. One charging of the battery by this means will furnish all the light one needs for ordinary purposes for a full week.



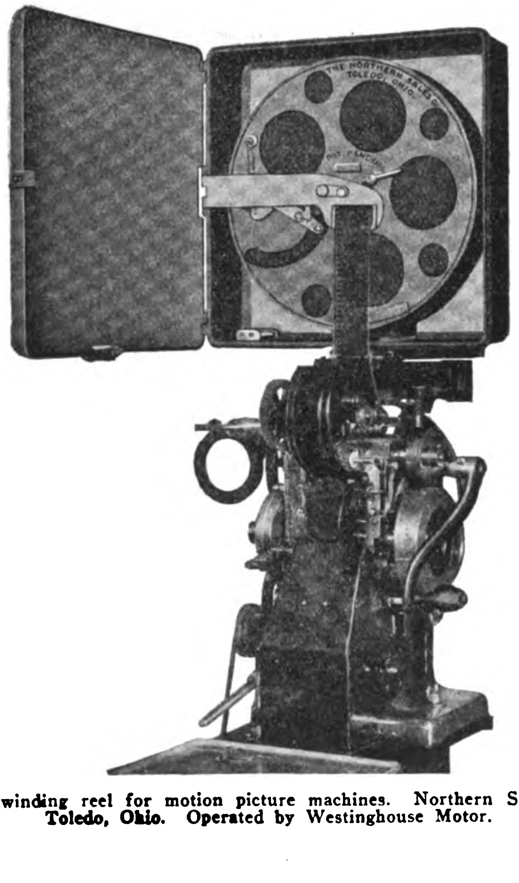
Scheme for generating electricity by direct application of horse power. Electric Horsepower Co., 906 Elm street, Cincinnati, Ohio.

This device illustrates how one horse power expended through a certain period can be transformed into two or more horse power expended through a shorter time.

Non-Rewinding Motion Picture Reel

The Northern Sales Co., Toledo, Ohio, has perfected a reel that eliminates the rewinding of motion picture films. The revolutionary feature of this reel is that the film is drawn from the inside and not from the outside as heretofore. To do this successfully two problems had to be solved; the film could be brought out on a short turn, and it must be rewound by some force other than by its own pull.

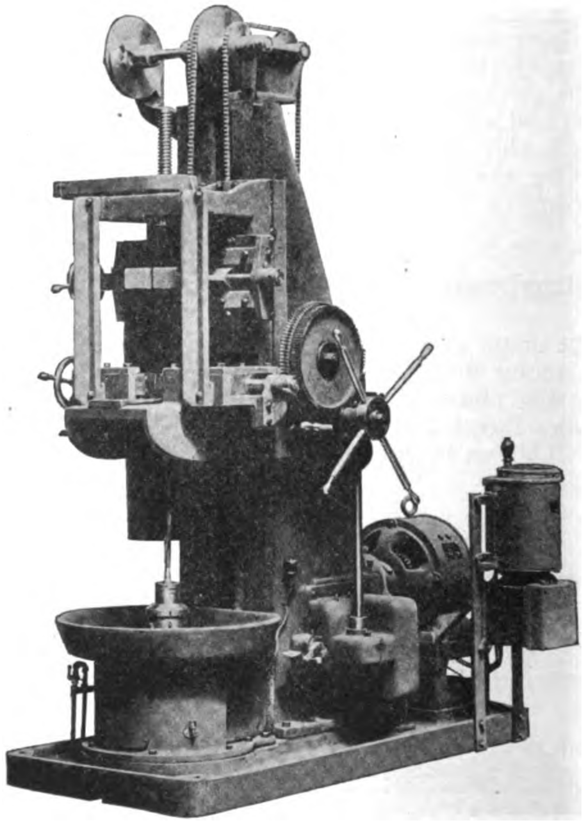
The first difficulty is overcome by a series of arms and guides that effectually prevent the film from kinking. The second is taken care of in an ingenious manner. The reel is made in two parts. The outside face of the reel is stationary, the inside face and the spool around which the film is rolled are removable and are geared to a Westinghouse motor through a magnetic clutch. The film passes out of the reel over a movable roller which is connected with a small switch. When the film becomes taut, the switch closes, the magnetic clutch is energized, and the reel is revolved by the motor, thus loosening the film. When the film becomes sufficiently loose, the switch opens and the reel stops revolving. Thus the film is fed out at just the right rate of speed, never becoming so tight as to break or so loose as to tangle.



Non-rewinding reel for motion picture machines. Northern Sales Co., Toledo, Ohio. Operated by Westinghouse Motor.

Foote-Burt Inverted Drill

This machine is designed for drilling 90 point carbon billets, 20 inches long and 4 or 5 inches in diameter. The advantage of drilling them in an inverted position is that the driving spindle is held rigid at the bottom of the machine and vibration is reduced to a minimum on the drill which is of small size and 24 inches long.

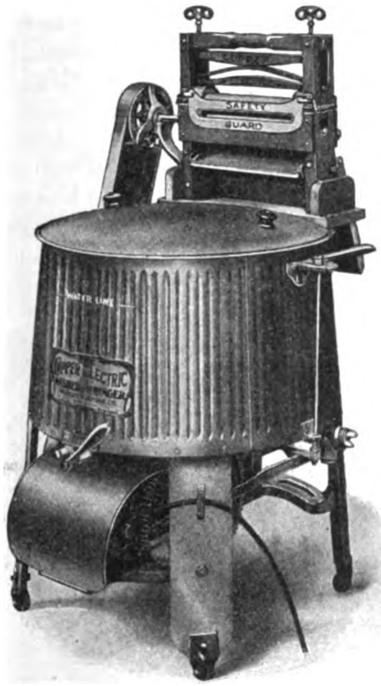


Inverted drill. Foote-Burt Co., Cleveland, Ohio. Operated by 8½ h.p. Westinghouse motor.

The head of the machine is really a jig for holding the pieces, and two sets of jaws are provided to grip the upper and lower parts of the billet and insure centering. There is also a jack screw for holding the billet in place. The machine is manufactured by the Foote-Burt Co., Cleveland, Ohio, and is driven by an 8½ h.p. Westinghouse direct-current adjustable speed motor, 800 to 1600 r. p. m., controlled by a drum controller.

Hurley Copper Dolly Type Washer

The Hurley Machine Co., 37 South Clinton street, Chicago, is now offering the trade the dolly type copper washing machine shown in the annexed illustration.

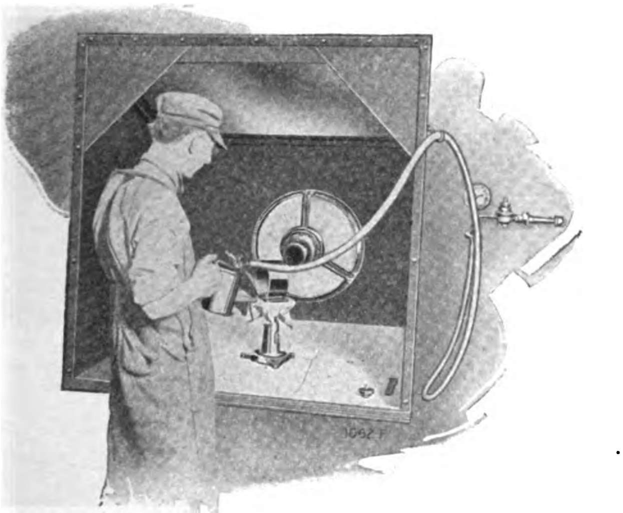


Copper electric washing machine. Hurley Machine Co., 37 South Clinton street, Chicago, Ill.

It takes up a floor space of about 28 inches square and weighs 168 lb. It has a capacity of 8 sheets, 96 towels, or 160 napkins. The tub is made of heavy copper. This machine is equipped with a 1/6 h.p. motor, which operates the washer and the wringer at the same time. The wringer is of the two-roll reversible type, the rolls being 11 inches long. All moving parts are covered, and all the machinery is under the tub.

Fan Motor for Spraying Booth

The Robbins & Myers Co., Springfield, Ohio, is marketing a new type of fully-enclosed exhaust fan for use in a compressed air spraying booth. It supplies fresh air and removes bad air and odors.



Enclosed exhaust fan motor used in compressed air spraying booth. Robbins & Myers Co., Springfield, Ohio.

The outfits are furnished complete with tripod ready to be mounted in booth, or any place where necessary opening is available. They come in two sizes, 12-inch and 16-inch for both direct and alternating current. The 12-inch fan has an air displacement of 1500 to 2000 cubic feet of air per minute, while the 16-inch displaces from 2200 to 3300 cubic feet of air per minute.

Clayton & Lambert Fire Pots and Torches

The Clayton & Lambert Mfg. Co., Detroit, Mich., is placing on the market a new kerosene fire pot No. 221 and quart size torch, No. 96, and No. 95 torch, which is similar but smaller, one pint capacity. The Nos. 96 and 95 torches are for brazing, and produce sufficient heat to quickly melt a quarter inch copper rod. The burners for both the torches and the fire pot are made with a generator that superheats the kerosene gas before it is burned, producing perfect combustion of the fuel and the maximum degree of heat. The automatic brass pump in the tank supplies ample air pressure. The filler plug at the top of the tank is made with an air valve screw which allows the air pressure to escape to extinguish the flame.

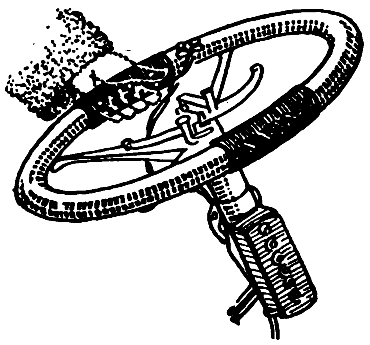
CLAYTON & LAMBERT MFG. CO. No. 96 DETROIT, MICH. U.S.A.
CLAYTON & LAMBERT MFG. CO. No. 221 DETROIT, MICH. U.S.A.

Kerosene torch and fire pot. Clayton & Lambert Mfg. Co., Detroit, Mich.

Ieco Ford Steer Warms

"Steer Warms" is the name given by the Interstate Electric Co., Baronne and Perdido streets, New Orleans, La., to an electrically operated device for keeping the hands warm while running a Ford car in cold weather.

They consist of two neat leather covered grips, one for each hand, which lace on the steering wheel at convenient places for driving. Special resistance wires are placed between two copper plates in such a way that a very small current is sufficient to keep the grip warm. After the grips reach a certain temperature, they will get no hotter, but will retain this same heat as long as the current is turned on.

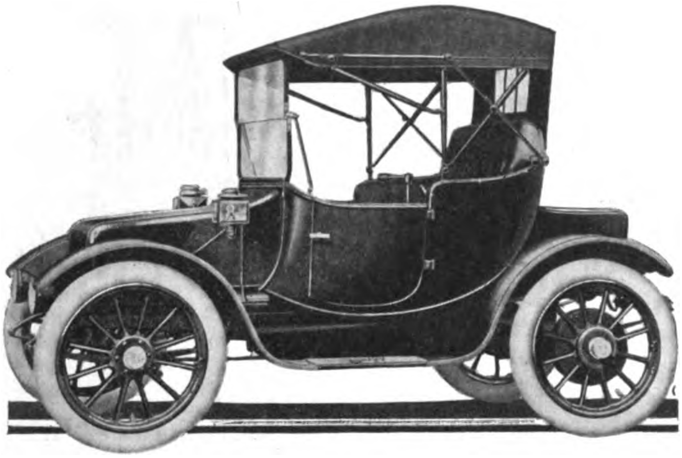


Ieco Ford "steer warms." Interstate Electric Co., Baronne and Perdido streets, New Orleans, La.

Ieco steer warms of the special Ford type consume only 20 watts, and this amount of power is easily secured from the surplus provided by the Ford magneto. Steer warms of the standard model for other makes of cars also are designed to consume but little current. They can be supplied from any starting or lighting system operating at 6 or 12 volts, or on seven dry batteries.

Rauch & Lang Electric Roadster

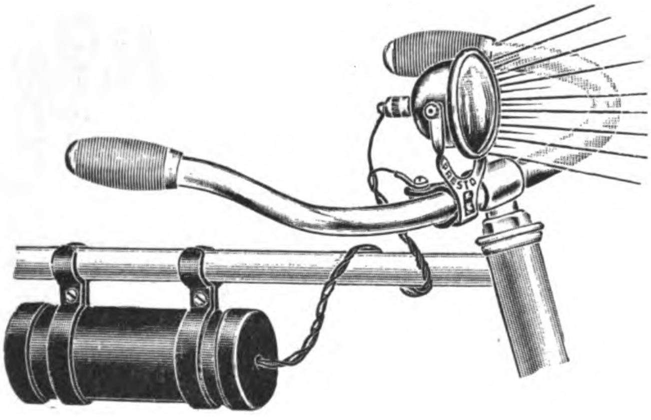
The Rauch & Lang Carriage Co., Cleveland, Ohio, has recently brought out the model R 5 electric roadster shown herewith. It is upholstered in blue, green, or maroon bloadcloth, has a wheel base of 92 inches, standard tread, and is operated by worm drive on a battery of 41 cells, 11 M. V. Hy-Cap Exide standard equipment. This model is provided with an auxiliary folding seat, two side lamps, two head lamps, tail lamp, wind shield, Warner auto meter, Waltham 8-day clock, and Klaxon horn. The cut shows the windshield only, but the car comes completely closed on both sides so as to make it weatherproof for the business man.



Model R 5 electric roadster. Rauch & Lang Carriage Co., Cleveland, Ohio.

"Presto" Electric Bicycle Lamp

A recently marketed device for producing electric light on bicycles is called the "Presto" electric bicycle lamp. It is operated from an ordinary No. 6 dry battery and can be attached to the handle-bar of any bicycle. It is furnished complete with sufficient wire to reach from the bicycle lamp to the dry battery which is placed in a metal container equipped with clamps to attach to the frame of the bicycle.



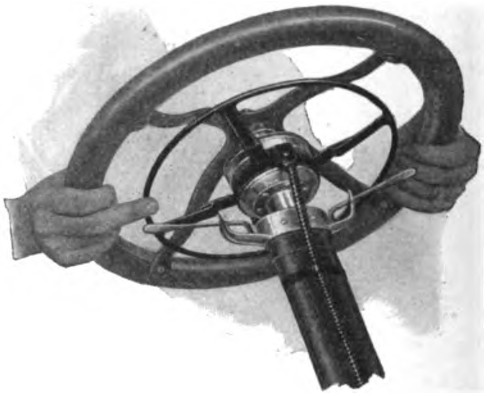
Presto electric bicycle lamp. Metal Specialties Mfg. Co., 730-738 West Monroe street, Chicago, Ill.

The reflector on this lamp is adjustable so that the ray of light can be thrown on the ground, directly in front of the bicycle or at any angle which might be desired.

It comes complete with clamps for handle-bars, weather-proof wires from lamp to battery, and metal container with clamps for holding same to cross-bar. It is made by the Metal Specialties Mfg. Co., 730-738 West Monroe street, Chicago, Ill.

Seng Horn Switch

The Seng switch for electric horns is operated by the touch of a finger extended from the hand that grasps the steering wheel. Pressure anywhere on the switch ring makes a contact, closes the circuit and makes the horn respond.



Horn switch. W. P. Seng, 1450 Dayton street, Chicago, Ill.

It is easily and quickly attached to the steering post of any car, and may be used in connection with either a single or a double wiring system. All contact points are made of German silver.

This switch is equipped with three feet of flexible conduit and wire (sufficient to reach down through the dash), and clamps for fastening the conduit to the post. It is made by W. P. Seng, 1450 Dayton street, Chicago, Ill.

Trinity Automobile Bell

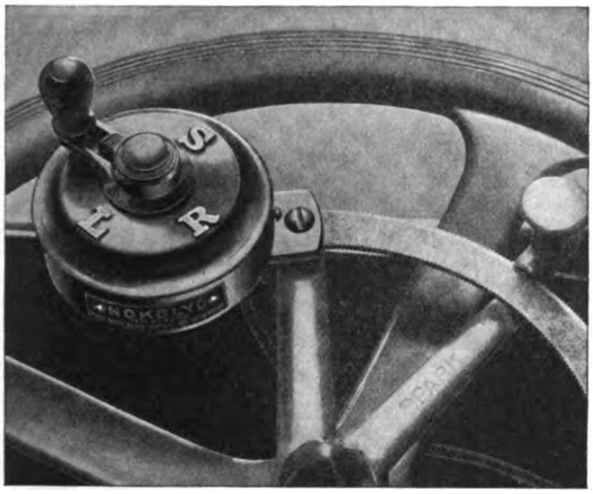
The Trinity Bell Electric Mfg. Co., 5108 Calumet avenue, Chicago, Ill., is offering the trade an electrically operated bell which is designed to supersede the other forms of automobile signal apparatus now in general use. This bell signal is made in three sizes and will fit any make or style of car. In addition to the

Trinity bell automobile signal. The Trinity Electrical Bell Mfg. Co., 5108 Calumet avenue, Chicago, Ill.

bell feature, this signal also carries a red light, both bell and light being operated by a push button conveniently placed. The current to operate the bell and light can be obtained from any of the sources of electrical energy on the car.

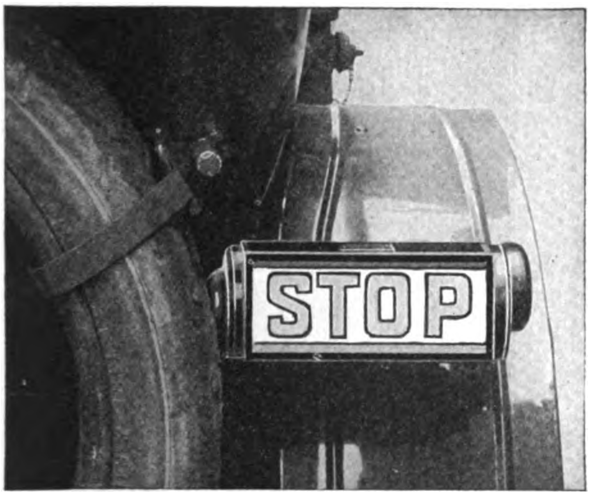
Nokolyd Motor Car Signal

Our readers will find it worth while to look into the merits of the new automobile signal accessory shown in the accompanying cuts. It has just been put on the market by the Nokolyd Signal Co., 40 West 13th street, New York, having been exhibited for the first time at the automobile show in New York last month. As shown in the cuts, it consists of a small controller conveniently mounted on the steering wheel and connected with a signal device located on the right hand side of the rear of the car.



Controller used in Nokolyd signal system for motor cars. Nokolyd Signal Co., 40 West 13th street, New York.

With the handle in the position shown in the cut the signal in the rear is blank. By simply throwing the controller handle to one of the other three positions shown, the signal in the rear is made to register "Stop," "Right," or "Left." The entire device is electrically controlled, the lighting or ignition batteries supplying the energy. It operates at from 4 to 6 volts. After the signal is set the current is automatically turned off. At night the signal is brilliantly illuminated, and can be seen for several blocks by trailing cars. The "Stop" signal shows white letters on a red background; the "Right" signal is in black letters with an orange background; the "Left" signal is white letters with a green background. Both the right and left signals are also supplemented by arrows showing the direction in which the car will turn. When the car is running straight ahead and has no intention of stopping or turning, the signal appears plain white.



Signal on rear of motor car. Operated by controller shown above. Nokolyd Signal Co., 40 West 13th street, New York.

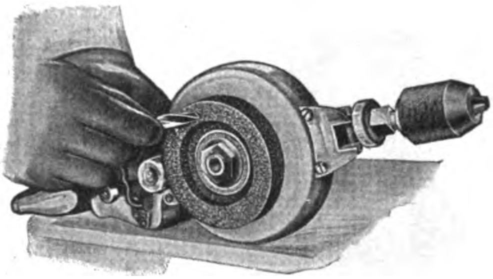
New Era Master Vibrator

A vibrator that is said to be guaranteed for life is shown in the accompanying illustration. It is made by the New Era Spring & Specialty Co., 870 Woodward avenue, Detroit, Mich. It is compactly constructed and enclosed in a thin pressed steel case. It weighs but 2 lb. and can be shipped by parcel post. The feature of this vibrator is said to be the indestructible spark points which are made of a special alloy that is harder and more heat-resisting than pure platinum. The makers claim that this master vibrator will improve the running of any make of car which has the ignition running on 2, 4, or 6 coils.

New Era master vibrator. New Era Spring & Specialty Co., 870 Woodward avenue, Detroit, Mich.

Temco Garage Drill

This drill, electrically operated, has recently been brought out by the Temco Electric Motor Co., of Liepsic, Ohio. It is designed so that it will carry an emery wheel attachment for sharpening tools and drills. It will also accommodate the Temco valve reseater for automobile engines.

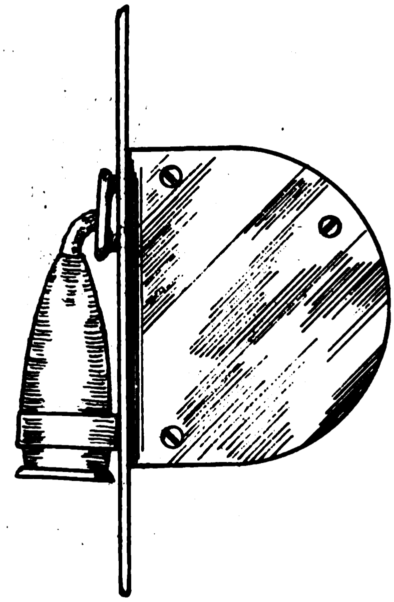


Portable electric drill for garage use. Temco Electric Motor Co., Leipsic, Ohio.

The method of attachment is the same as placing a drill in the chuck for drilling. The handle of the valve reseater is for support and not to give pressure to the reseater, as the weight of the equipment alone is sufficient. The stem that fits and operates the valve is allowed but a three-eighths turn. The drill spindle having a very high speed with so little work to perform, the valve reseater is operated at a very high speed which with the oscillating movement insures a rapid and perfect valve reseating.

Electric Cigar Lighter

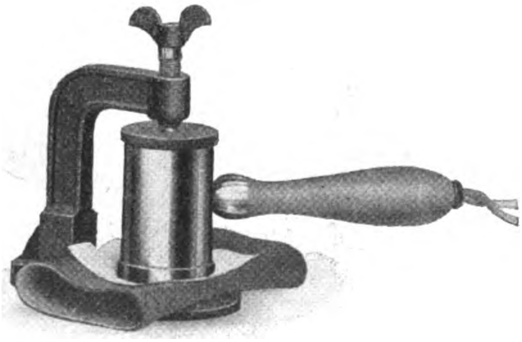
This device is for the man who goes motoring and craves a smoke while touring around. It is attached either to the lighting circuit or to the batteries direct. The cut shows a side view of the flush type after it is attached. To operate it, pull out the cord. The end of the lighter glows with sufficient heat to light either cigar or cigarette, the cord being long enough to give the light without a change of position. Upon being released the cord is automatically rewound on the reel and the current disconnected.



Side view of automobile cigar lighter. Electric Automatic Cigar Lighting, 556 West 27th street, New York.

Quick Action Vulcanizer

Henry T. Adams & Co., 6823 South Chicago avenue, Chicago, Ill., are offering the trade a new type of electrically operated vulcanizer for repairing rents and holes in shoes and inner tubes. This device attracted much attention at the New York automobile show last month. It operates on the lighting system of a car, the ignition generator on a Ford, or an ordinary 110-volt house lighting circuit, either alternating or direct current. This vulcanizer is said to reach 265 degrees almost instantly, and it draws only 8½ amperes from the storage battery. It can also be used as a handy household contrivance for repairing leaks in rubber boots, coats, waders, and water bottles.



Patent Pending

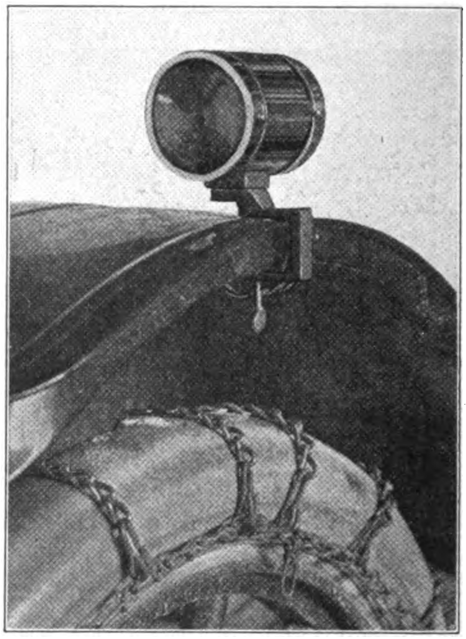
Quick action vulcanizer. Henry T. Adams Co., 6823 South Chicago avenue, Chicago, Ill.

Patent Pending

Manner of applying vulcanizer to automobile shoe. Henry T. Adams & Co., 6823 South Chicago avenue, Chicago, Ill.

Saratoga Pilot Lamp

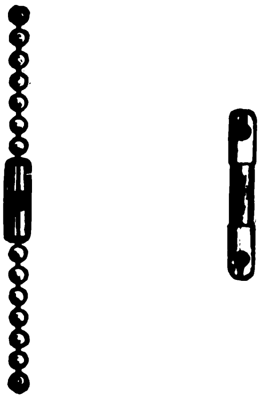
This lamp is designed to be placed on the left hand side of the front fender of the car. It is equipped with green lenses that makes them not only show at a distance, but also makes the outlines of the car distinct to all other cars. It projects its light rays both fore and aft, thus acting as a guide for drivers coming from the rear. It is furnished in black enamel, with nickel or brass trimmings to match the car.



Saratoga pilot lamp. Saratoga Pilot Lamp Co., 16 Philadelphia street, Saratoga Springs, N. Y.

Detachable Insulator and Splicing Link for Pull Socket Chain

A new detachable insulator and a splicing link for pull socket chain are shown in the accompanying illustrations. Both are made on the same principle and may be instantly attached or detached. With the insulator or splicing link attached the chain hangs perfectly straight.

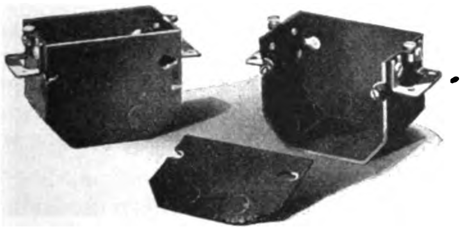


Detachable insulator and splicing link for pull socket chain. The Arrow Electric Co., Hartford, Conn.

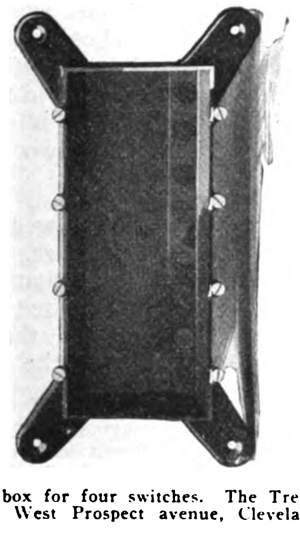
These devices are manufactured by The Arrow Electric Co., Hartford, Conn.

Tregoning Sectional Boxes

The accompanying cut shows in perspective and in detail a new pressed steel sectional box which has just been put on the market by The Tregoning Electric Mfg. Co., 422 West Prospect avenue, Cleveland, Ohio. As shown, this box has reversible ears which makes it adaptable for either old or new work. Several single sectional boxes can be assembled to carry as many as eight switches.



Pressed steel sectional box with removable ears. The Tregoning Electric Mfg. Co., 422 West Prospect avenue, Cleveland, Ohio.



Pressed steel solid box for four switches. The Tregoning Electric Mfg. Co., 422 West Prospect avenue, Cleveland, Ohio.

The second cut shows a Tregoning pressed steel solid box for four switches. This style of box can be furnished to accommodate either one, two, three, or four switches.

Electrical Piano Player

Carl Brown, 203 East Spring street, Columbus, Ohio, has recently developed an electrically operated piano playing device in which the pneumatic principle heretofore in general use is abandoned, electricity being substituted therefor. This device is said to be especially adapted for motion picture houses, the control being such that at any instant the character of the music can be made to harmonize with the picture on the screen. And it is said to be so simply constructed that any one with an ordinary mechanical head can readily understand and operate it.

Cox Motor Driven Pipe and Tube Bending Machine

J. Fillmore Cox, Engineering and Tube Bending Machine Works, 687 Boulevard, Bayonne, N. J., is now marketing a line of pipe and tube bending machines. These machines bend pipe or tube from a 3-inch radius on 1-inch pipe up to a 6-foot radius on 4-inch cold pipe. The larger sizes are equipped with General Electric motors.

Electric Sanitary Candy Maker

The Smith Cannery Machine Co., 2413 First avenue, South, Seattle, Wash., is manufacturing a new electrically operated automatic candy machine. With it one man can turn out five different kinds of cream wafers, at the rate of 2200 an hour, with no stop between batches. The machine is a long aluminum box with a box sectional frame and occupies a floor space of 2½ by 8 feet. One end contains the cooking, mixing, and dropping elements; removable trays into which the wafers are delivered are at the other end.

The Phase Advancer

While synchronous condensers are ordinarily applied for improving the power factor of a system, the phase advancer is designed primarily for improving the power factor of individual induction motors, although in special cases it is capable of wider application. This machine has been made commercially practicable within the past year. Its characteristics may be briefly outlined as follows:

The phase advancer stands in the same relation to an induction motor as an exciter does to a synchronous motor. However, for the induction motor, continuous current cannot be used for the magnetizing current in the secondary because the motor slips under load. The magnetizing current must be a polyphase current of low frequency, which corresponds in each instance to the slip of the induction motor.

The phase advancer consists of a continuous current drum armature with a commutator having three brush studs per pair of poles displaced relative to one another by 120 electrical degrees. The stator merely consists of a frame with the laminations assembled but having no slots or windings.

The phase advancer is direct connected to a small squirrel cage constant speed induction motor. The power necessary to drive the phase advancer is only that required to supply the friction, windage and hysteresis losses.

AUTOMOBILE MATTERS

ELECTRIC VEHICLES—ELECTRICAL APPLIANCES FOR CARS, TRUCKS, AND GARAGES—NEWS AND ITEMS ABOUT THIS ACTIVE BUSINESS.

The automobile show which closed at New York on January 9, reported the largest paid attendance of any show ever held here. The increase over the largest preceding year was more than 12 per cent. It is reported that more than 600 cars were sold at retail at the show during the week,. averaging about 100 cars per day. A feature of the show this year was the large number of accessories, two floors being given up to these devices.

The use of electricity in the automobile is one of the modern developments which has grown rapidly. At first, the only use that electricity found in the automobile was for purposes of ignition. However, the convenience of electricity has won over the automobile field in a remarkable manner in the past few years. In these modern days, no automobile is complete unless the gas engine charges are electrically ignited, and it is equipped with electric lights, and an electric motor for starting the engine and electric devices for shifting the gears, and doing many of the things which formerly were done by some other means. Another development is the magnetic pinion shift wherein the starting motor is thrown in gear by means of a magnetic device instead of a manually-operated device as in previous years.

Within the next few years the New York fire department will have abandoned all its picturesque fire horses, substituting therefor automobile engines and trucks. The fire department estimates that this change will result in a saving of $485 per year for every engine. At the end of last year there were 342 pieces of motor-driven fire apparatus in New York.

Gray & Davis have designed a special electric starting system for Ford cars. This system sells for $75.

The Walker Vehicle Co., Chicago, has purchased the factory and business of the Chicago Electric Motor Car Co., adding the latter's line of electric passenger cars to its own business, which has been heretofore confined exclusively to commercial electric trucks. Salesrooms have been opened in a modern structure built for the purpose at 2700 Michigan Boulevard, Chicago, for the display and sale of electric passenger cars.

Two new devices designed for attachment to automobiles that recently have made their appearance on the market give evidence of considerable ingenuity. The first of these is designed to show when a car is used without the authority of the owner. It consists of a small case containing clockwork which unwinds a strip of paper past a needle. The needle is fastened to a delicately balanced horizontal pendulum and perforates the paper when moved by the vibration of the car. The tape is marked off in divisions of time so that the perforations indicate not only when the car was used but also the length of time. The other device would seem to have been long in demand. It is a simple grease cup with a quick detachable lid so that the cup can be quickly and easily filled. The lid is held by a bayonet lock.

The general use of electric starting and lighting systems has eliminated for the time being the magneto which formerly provided electric sparks for ignition purposes. The storage battery used in connection with the starting and lighting system now also furnishes the electric spark that ignites the gas in the cylinder.

Statistics of the motor car industry show that over 1,500,000 cars are now registered in the United States. More than 500,000 cars were built in 1914, at a cost of nearly $500,000,000 There are 450 motor car makers, 15,000 automobile dealers, 13,630 garages, and 680 supply houses.

The Waverly Company, of Indianapolis, Ind., has brought out a four-chair electric brougham with a curved sill that brings the floor 6 inches nearer the ground than in most electrics. Two large window openings replace the three smaller ones usually found in cars of this kind. The four chair seats are grouped in a three-quarter circle.

The Cutler-Hammer Mfg. Co., Milwaukee, had an interesting exhibit at the New York Automobile Show last month. The principal device shown was the electric gear shift for gasoline automobiles which was mounted on a Winton transmission. The operation of this device, which eliminates the hand shifting of gears, is controlled by push buttons mounted in the center of the steering wheel. The Winton Six is one of the 1915 cars to be furnished with electric gear shift.

A new type of car called the Owen magneto motor car, is promised for the near future. This is a combination gasoline and electric car that will run at any speed desired instead of being limited to two or three fixed speeds. It is said to combine the good points of both gas and electric cars and at the same time to be free of their faults. The Entz magneto transmission system will be utilized.

The ninth edition of the New York Electric Vehicle Association's book of "Electric Automobile Charging Stations and Route Maps" has just been issued. This book, which is an annual publication, has several new features in the 1915 edition in addition to all of the valuable material previously used, which has been revised and brought up to date. There is a list of all charging stations in New York City and within a radius of more than a hundred miles, together with the distance of each from Columbus Circle, the maximum amperage and voltage available, the hours during which service can be obtained, the cost per kilowatt, and the price charged for "boosting." One of the new features is a map of Manhattan and the Bronx, showing the location of all charging stations. It will be sent free upon request at the offices of the Association, Irving place and 15th street, or at the garage, Central Park West and 62nd street.

To keep abreast of the Fire Department, the New York Police Department is rapidly substituting motor cars for police apparatus heretofore drawn by horses. There are now 14 automobile patrol wagons in the police department, 13 gas cars, and one electric. In addition to the cars, this department is provided with a big fleet of motorcycles. The mail car used by the police department, a Ford, runs 105 miles a day in traversing its route. This car has a record of 37,290 miles in one year.

The Simplex Auto Specialty Co., of Detroit, Mich., is now handling the "Yankee" shock absorber for use on Ford and other makes of cars.

The company making the White car has designed the wiring, conduits, and connectors so that this adjunct is installed on the chassis instead of on the body of the car. Because of this design the White body is removable as a unit without disturbing any of the electrical connections, side feed pipes, or other attachments. All electrical switches, and the starting and lighting wiring, have been removed from the dash and mounted in a compact cylinder on the steering column.

At the annual meeting of the Society of Automobile Engineers held in New York last month the electric equipment division reported on fittings for single wire electric systems on gasoline cars. This report gives the dimensions of bulb bases, sockets and connector plugs, lamp brackets, and junction boxes. The miscellaneous division reported on standard dimensions for mechanically driven air pumps, yoke end pins, the extension of the S. A. E. thread standard beyond 1½ inch diameter, standardization of cotter pins, width of flat belts for driving fans, and hose clamp dimensions. The research division made a report which included a formula on vehicle taxation. The electrical vehicle division reported on motor characteristics and voltages, standardization of name-plates, insulation, controllers, number of cells in standard battery equipment, sizes of wire, and efficiency tests of solid rubber tires.

One of the most extraordinary developments in the electrical field has been that of the lighting and starting systems now practically standard for all American motor cars. One of the most difficult problems to solve was how to control the battery charging current so that the battery was always kept in perfect condition and fully charged and never subjected to conditions which would damage it or exhaust it. At the show held in New York last month practically all of the methods of control for the battery current exhibited last year were replaced by the method in which there is a small rapidly vibrating contact whose vibratory motion is automatically controlled by the battery current itself, and which in turn automatically controls the battery charging current. In view of this, interest attaches to a patent just issued to H. Ward Leonard, which seems to cover this method of controlling the battery charging current, now so universally used.

The Splitdorf-Apelco starting and lighting system is a single unit for Ford cars which consists of a motor-generator, indicating automatic switch and starting switch, and a storage battery. All the apparatus necessary successfully to install and operate this starter is supplied with the outfit.

In a test run made by fourteen electric passenger cars on December 5 from Los Angeles to a neighboring town and return, a distance of almost 100 miles on a single charge, not even a wrench had to be applied to a single car. An electric service truck carrying a 1,500-lb. load accompanied the cars and made the trip without a hitch and with power to spare. This run was made by owners of Beardsley electrics, the Beardsley company offering a silver medal to any owner who made 90 miles on one charge and a gold medal to any who reached 100 miles. It is worthy of note that no one won the silver medal because everyone qualified for the gold. The speedometers were sealed at the start and were not opened until the batteries were exhausted, which was at about six o'clock the same evening, when it was found that the cars averaged 100.1 miles each, first place being taken by a car which made 112.1 miles.

The Ford car seems to invite more varieties of accessories than any other car now made in America. Owners of these cars who visited the recent automobile show in New York were perplexed by the large number of electric starting and lighting systems especially designed for Ford cars which were put on exhibition. Among those shown were the Kemco two unit system made by the Kemco Electric Mfg. Co., Cleveland, Ohio; the Federal-Cesco electric starter made by Chicago Electric Specialties Co., Chicago, Ill.; and the starting and lighting system made by Gray & Davis, Cambridge, Mass.

Engineers for the New York Central Railroad and for Wm. A. Pope, of Chicago, recently witnessed the preliminary test of a 200-h.p., four-cylinder gasoline engine at the works of the Bruce-Macbeth Engine Co., Cleveland. It is out of the ordinary for so large an engine to be operated on gasoline. This engine is to be used for emergency service only, and the matter of fuel cost is not important. A distinctively new carburetor and governing device was designed for this particular engine, and has worked out most successfully, handling the engine from no load to 240 h.p. without any adjustment and without missing. The complete double system of ignition ordinarily furnished is supplied, and the compressed air starting equipment is such as to act upon all cylinders so that the engine can be started quickly from any point by the opening of but one high pressure valve and without the shifting of any cams or other adjustments.

MOTOR MARKETS

USES FOR MOTORS, GROUPED ACCORDING TO STATED HORSE-POWER LIMITS.

Motors of 1-10 Horse Power and Less

[MOTOR DRIVE SERIES—ARTICLE NO. 40]

If asked to name some of the uses for motors of 1-10 horsepower and less, for 110- and 220-volt circuits, most of us would probably only be able to think of about ten of these uses, principal among them being the operation of vacuum cleaners, vibrators, hair dryers, drink mixers, and apparatus of a similar nature. And it would naturally be supposed that there would be but a few uses for such small motors on regular lighting or power circuits. The accompanying table, however, gives the names of 100 different devices that are capable of being operated by motors of 1-10 horsepower or less. This list of names therefore represents the market for such motors, and is indicative of the class of companies buying motors of 1-10 horsepower or less.

The smallest motor made for regular lighting circuits is a 1-200 horsepower motor. Among other things this motor is used for operating temperature regulators, and in connection with telephone switchboard work. Then there are motors of 1-75, 1-50, 1-30, 1-25, 1-20, 1-16, 1-15, 1-12, and 1-10 horsepower. The illustrations show some of the uses for motors of all these different sizes.

For the operation of the majority of the devices mentioned it will be found that the motor should be a universal one; that is, it should be capable of operating on either direct or alternating current, and usually the speed is from 6,000 to 8,000 revolutions per

100 Uses for Motors of 1/10 Horse Power and Less

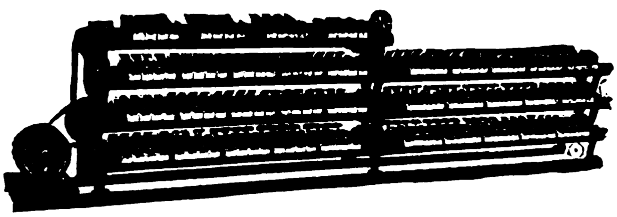
The following devices are capable of being operated by motors of 1/10 horsepower or less, on 110- and 220-volt circuits. In some cases the devices require a universal motor—one that can be used on either alternating or direct current:

Adding machines
Addressing machines
Advertising devices
Air compressors, dental
Arc controllers
Assay mill machines
Barber poles, revolving
Beer pumps
Bobbin winders
Buffers and grinders
Buttonhole machines
Card printing machines
Cash carriers
Cash registers
Centrifuges
Channel tip turners
Cleaners, vac., portable
Clock winders
Cloth cutters
Clothes washers
Coffee mills
Coin counters
Coin wrappers
Corn poppers
Coupon cutters
Currying machines
Dental engines
Dental lathes
Developing rockers
Dictaphones
Dinkers (tanneries)
Dish washers
Drills, jewelers' bench
Drills, small portable
Drink mixers
Duplicating machines
Electro-med. appliances
Erasing outfits
Fans
Forge blowers
Hair dryers
Hammers, portable
Hat cleaners
Horns, auto.
Horse clippers
Hospital appliances
Humidifiers
Key cutting machines
Label gummers
Labelling machines
Lens grinders
Letter folders
Letter openers
Letter sealers
Magnets
Mailing machines
Massage machines
Meat slicers
Milk bottle washers
Milk testers
Moving picture machines
Musical instruments
Mutascopes
Office ventilators
Optical machines
Ozonizers
Pattern cutters
Pencil sharpeners
Penny arcade machines
Perforating machines
Player pianos
Polishers
Razor blade sharpeners
Rotary spark gaps
Scorers (leather)
Screwdrivers
Sewing machines
Shoe polishers
Showcases, revolving
Sign flashers
Soda fountain chg. sets
Static machines
Sterilizers
Stiffening skivers
Stock tickers
Tabulating machines
Talking machines
Tattooing machines
Telephone ring. sets
Telephone switchboard work
Telegraph instruments
Temperature regulators
Toys (with reducer)
Typewriters
Ventilating fans
Vibrators
Winding machines
Window displayers
Window shade hoists
Wireless instruments

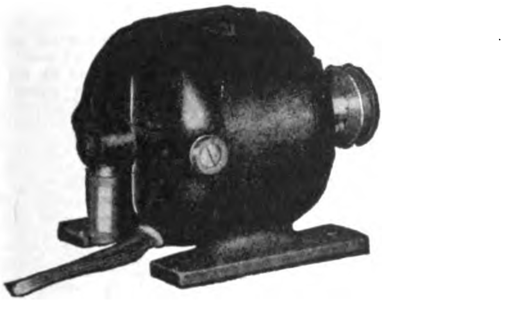
The illustrations show how motors are used for operating a number of these devices, and give definite information as to the exact horsepower of the motor in each case.

minute, though in a few isolated cases it will be found that a motor is required having a speed as low as 1,200 revolutions per minute.

For devices such as suction cleaners, buffers and grinders, polishers, hat cleaning machines, vibrators, hair dryers, drink mixers and the like, the motor is directly connected to the device, and forms an integral part of it. For devices such as adding machines, player pianos, moving picture machines, and so on, the motor is either directly connected to the device, connected by gears, or by a small round belt.

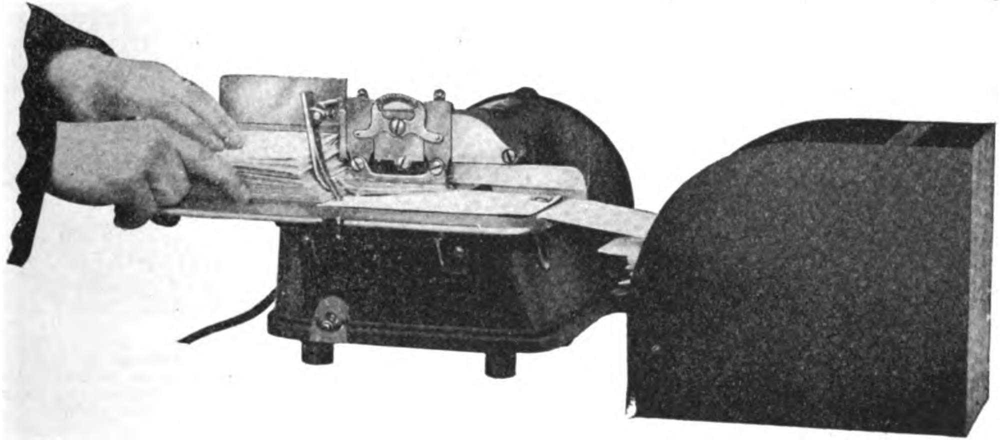


Betts & Betts sign flasher operated by a 1/30 h.p. single phase, 60 cycle, 110 volt, a.c. motor at 1,750 r.p.m., made by the Robbins & Myers Co., Springfield, Ohio.



Showing a 1/200 h.p. motor, made for 110 and 220 volt circuits for both a.c. and d.c.; weight 10 lb.; wick oiled; any style base. Western Electric Co., 463 West street, New York.

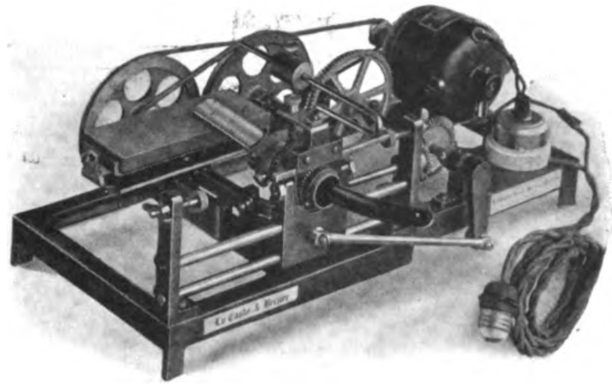
Centrifuge operated by a 1/20 h.p., 6,000 r.p.m. motor, for either direct or alternating current on voltages from 100 to 120 volts; size over all, 10½ by 13 inches. Made by Lindstrom, Smith Co., 1100 South Wabash avenue, Chicago, Ill.



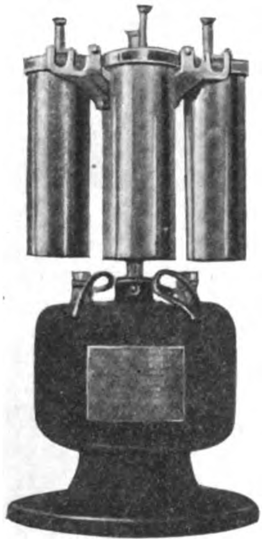
Letter opener, made by Lightning Letter Opener Co., Inc., Rochester, N. Y., which opens 500 or more letters per minute, without cutting enclosures, operated by 1/10 h.p. motor geared to machine; for 110 volts, a.c. and d.c. motor made by The Peerless Electric Co., Warren, Ohio.

Dumore suction cleaner for cleaning upholstery, clothes, and billiard tables. Operated by a 1/20 h.p., 6,000 r.p.m. motor for either direct or alternating current. Made by Wisconsin Electric Co., 1635 Junction avenue, Racine, Wis.

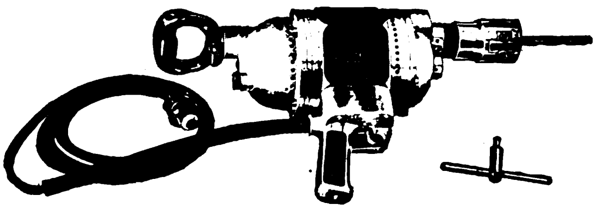
Ensign adding machine operated by a 1/10 h.p. motor, direct geared, made by the Holtzer Cabot Electric Co., Brookline, Mass.



Razor honing machine made by Lo Casto & Berger, operated by a 1/50 h.p., 110 volt, 1725 r.p.m., die cast frame, totally enclosed, d.c. motor made by Diehl Mfg. Co., Elizabeth, N. J.



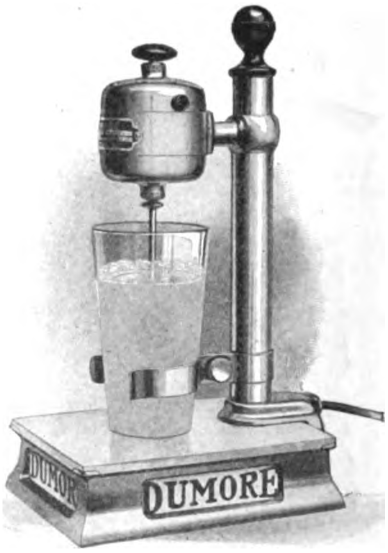
Centrifugal testing rig made by D. H. Burrill & Co., Little Falls, N. Y., for testing milk, operated by a 1/10 h.p., single phase motor completely enclosed, made by The Holtzer Cabot Electric Co., Brookline, Mass.



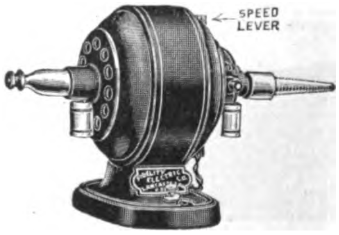
Black & Decker drill, operated by a 1/12 h.p., single phase, 60 cycle, 110 volt, a.c. motor with speed variation of from 8,000 to 1,000 r.p.m., made by The Robbins & Myers Co., Springfield, Ohio.

Drink mixer operated by a 1/25 h.p. motor attaining a speed of 6,000 r.p.m without load; for direct or alternating current on voltages from 100 to 120 volts, any cycle; size over all, 9 by 8 inches. Made by Lindstrom, Smith Co., 1100 South Wabash avenue, Chicago, Ill.

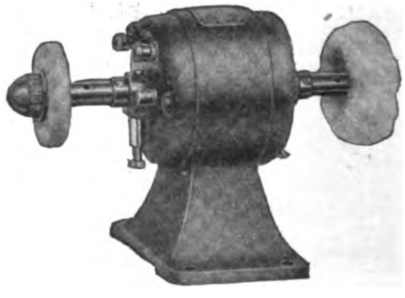
Hat cleaning machine—a 1/10 h.p., motor mounted on a special heavy base and provided with an adjustable chuck on end of shaft; made for 110 or 220 volts, d.c., and 110 volts, 25 or 60 cycles, a.c.; speed 2,500 r.p.m., with 50 per cent, reduction. Made by the Fidelity Electric Co., Inc., Lancaster, Pa.



Illuminated Dumore drink mixer operated by a 1/25 h.p., 8,000 r.p.m. motor for either direct or alternating current. Made by Wisconsin Electric Co., 1635 Junction avenue, Racine, Wis.

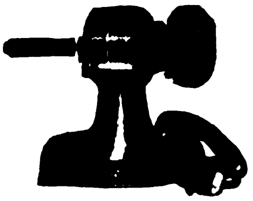


Polisher and buffer—a 1/10 h.p., 60 cycle, 110 volt, a.c. motor with taper attachment for holding soft wheels and one for hard wheels, also with sand paper chuck and small drill or burr chuck; speed control by shifting brushholders by lever, giving from 3,800 to 900 r.p.m. Made by The Fidelity Electric Co., Inc., Lancaster, Pa.

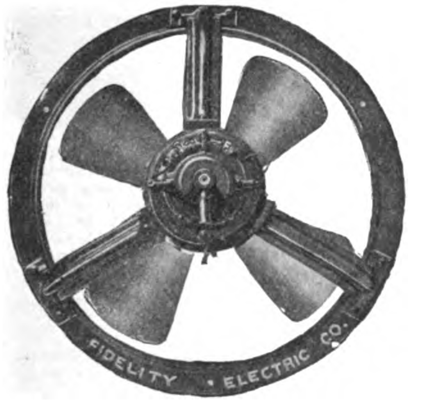


Buffer and grinder with rag and emery wheels—motor 1/30 h.p., at 1,800 r.p.m.; for standard voltages. Made by Western Electric Co., 463 West street, New York.

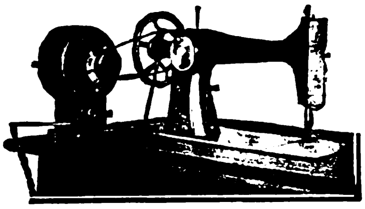
1/20 h.p., 6,000 r.p.m. utility motor; outfit consists of motor, 8-inch fan, emery wheel, buffer, and pulleys; size over all with fan attached, 12 by 6 inches. Made by Lindstrom, Smith Co., 1100 South Wabash avenue, Chicago, Ill.



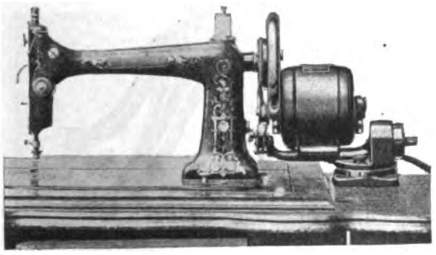
Household grinder and polisher—a 1/30 h.p., motor for either a.c. or d.c., at 110 volts; speed 3,500 r.p.m. Furnished complete with cord and plug, soft wheel for polishing, and hard wheel with wide face for sharpening knives, etc. Made by The Fidelity Electric Co., Inc., Lancaster, Pa.



Ventilating fan operated by a 1/12 h.p., single phase, 60 cycle, 110 volt, a.c. motor, at 2,000 r.p.m., with 50 per cent. reduction by means of lever on side of motor; fan displaces approximately 2,400 cu. ft. of air. Made by The Fidelity Electric Co., Inc., Lancaster, Pa.

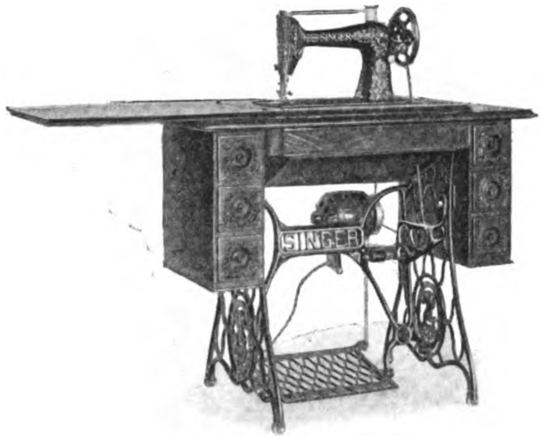


Family sewing machine operated by a 1/16 h. p. motor; made for 110 volts, d.c., or 110 volts, 25 or 60 cycles, a.c.; motor belted to machine head proper; speed control by friction brake, the greater the pressure on treadle the greater the speed. Made by The Fidelity Electric Co., Inc., Lancaster, Pa.



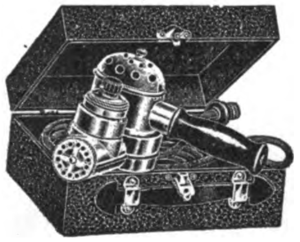
1/30 h.p., 1,800 r.p.m. motor operating family sewing machine; for standard voltages. Western Electric Co., 463 West street, New York.

Sewing machine operated by a 1/16 h.p., 7,000 r.p.m. Dumore motor, for either direct or alternating current. Regulation secured through automatic switch and idler. Made by Wisconsin Electric Co., 1685 Junction avenue, Racine, Wis.



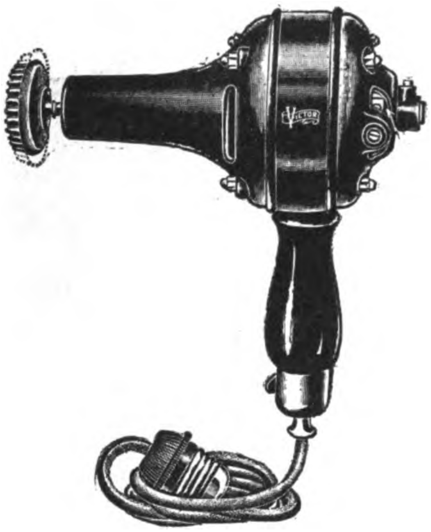
Singer sewing machine operated by a 1/25 h.p., 60 cycle, 110 volt, a.c. motor; speed controlled by treadle pressure, the greater the pressure the greater the speed. Made by Diehl Mfg. Co., Elizabeth, N. J.

Vibrator operated by a 1/25 h.p., 4,000 to 6,000 r.p.m. motor, for either direct or alternating current on voltages from 100 to 120 volts. Made by Lindstrom, Smith Co., 1100 South Wabash avenue, Chicago, Ill.



Hair dryer operated by 1/20 h.p., 6,000 r.p.m. motor, for either direct or alternating current on voltages from 100 to 120 volts; size over all, 6 by 8 inches. Made by Lindstrom, Smith Co., 1100 South Wabash avenue, Chicago, Ill.

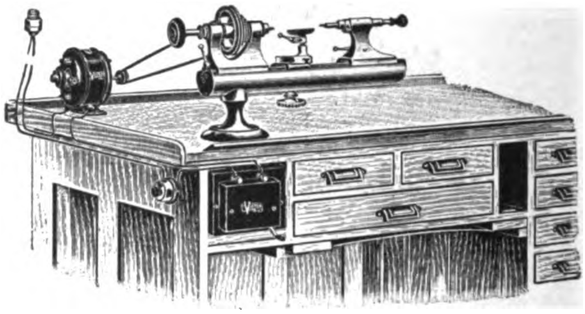
Hoover suction sweeper, made by The Hoover Suction Sweeper Co., New Berlin, Ohio, operated by a 1/10 h.p. 4,500 r.p.m., Robbins and Myers motor. A smaller size of this make of sweeper operates with a 1/12 h.p., 6,000 r.p.m. motor.



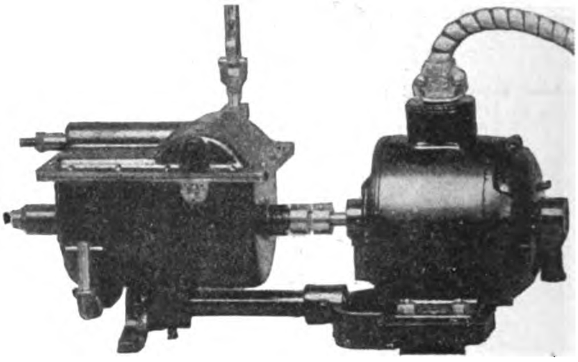
Vibrator operated by self contained 1/20 h.p. motor for a.c. and d.c., 110 volts. Made by Victor Electric Co., Inc., Jackson boulevard and Robey street, Chicago, Ill.

Portable electric suction sweeper, made by The Wise-Harrold Electric Co., New Philadelphia, Pa., operated by a self contained 1/10 h.p. motor, made by The Peerless Electric Co., Warren, Ohio.

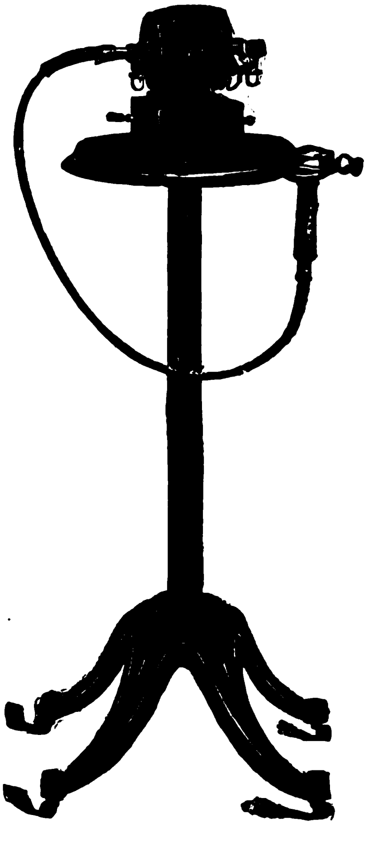
Dumore portable suction cleaner, with double fans and double outlet, operated by a 1/10 h.p., 6,000 r.p.m. motor for either direct or alternating current. Made by Wisconsin Electric Co., 1635 Junction avenue, Racine, Wis.



1/20 h.p., 110 volt motor, for a.c. and d.c., belted to watchmaker's bench lathe, controlled by rheostat. Made by Victor Electric Co., Inc., Jackson boulevard and Robey street, Chicago, Ill.



Arc controller. Made by Speed Controller Co., 257 William street, New York, for maintaining an arc at exactly any predetermined size or voltage, and to feed carbons of lamp to that given relationship, without variation. Operated by a 1/12 h.p. motor. Made by The Peerless Electric Co., Warren, Ohio. Particularly adapted to projecting arcs for moving picture machine.



1/12 h.p., d.c. motor, direct connected to flexible shaft of massage machine. Made by Victor Electric Co., Inc., Jackson boulevard and Robey street, Chicago, Ill.

CENTRAL STATION MISCELLANY

The Denver Gas & Electric Light Co., working in conjunction with the appliance department of the General Electric Co., recently completed a domestic appliance campaign that resulted in the placing of approximately 6,000 devices.

J. G. Ross has been reappointed superintendent of the Seattle City Lighting Department for three years. In reappointing Mr. Ross, Mayor Gill praised his previous service in successfully managing the Seattle municipal plant in spite of many drawbacks and some political chicanery.

The Edison Electric Illuminating Co., of Cumberland, Md., will open a new plant within the next 30 days.

The national joint committee on line construction, composed of representatives from the various engineering societies, telegraph and telephone companies, and the U. S. Bureau of Standards, is now preparing specifications, and recommendations covering both overhead and underground line crossings, also parallel lines. Farley Osgood is chairman of the committee.

"How to Overcome Some Operating Difficulties of Small Electric Utilities," was the title of a paper read at the recent convention of the Wisconsin Electrical Association, at Milwaukee. This paper was prepared and presented in the interest of small electric utilities operating in places of below 2,000 persons. It called attention to errors frequently made in selecting, installing, and operating equipment, and the consequent difficulties which it is thought impossible to overcome.

The best burglar insurance is an Edison mazda lamp burning all night, as a dark house is a temptation to thieves to break in and steal, is the substance of two broadsides accompanying the January issue of the *Edison Business Builder,* published by the Edison Lamp Works of the General Electric Co., Harrison, N. J. The third broadside, used as a center page for this issue, says: "If you were a burglar which house would you choose?"

As a part of its welfare work, the Edison Electric Illuminating Co., of Boston, is planning to allow its employees a certain amount of time away from regular duties, without the loss of pay, for the study of practically any subject that the employee may choose. The details of this plan are now being arranged by R. S. Hale, of the Special Research Department. In all cases the committee in charge will require reports of attendance, and in most cases will probably require the employee to take an examination to test his knowledge of the course he is pursuing. As projected, the plan includes a course of lectures at some school, correspondence courses, evening studies, and visits to the offices and works of other companies. In cases where such work is undertaken outside of the regular working hours the employee might, if the committee approve, be allowed extra half holidays or whole days in order to balance the whole time or portion of the time consumed in "own time" work.

New business contracted for during the calendar year 1914 by the Edison Electric Illuminating Co., of Boston, Mass., exceeded all previous records and surpassed that booked in 1913 by 25 per cent. The output for the week ended Christmas Day was 7 per cent. ahead of the corresponding week a year ago, the peak load of the year being 65,342 kw., compared with 63,131 kw. last year, a gain of 3.5 per cent. The largest daily output in the company's history was on December 21, when 777,000 kw-hr. was generated.

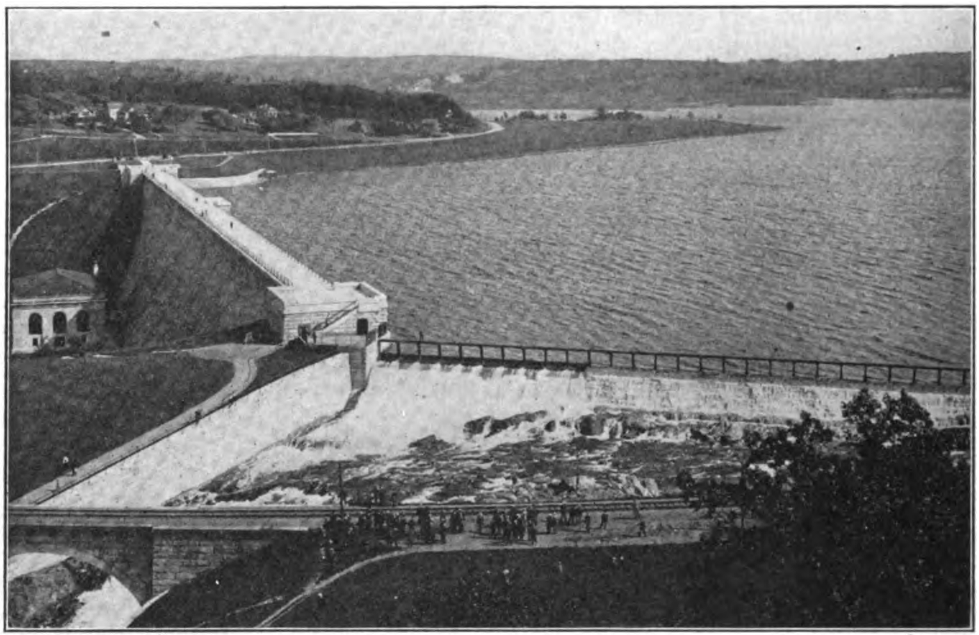
Immediately upon resuming office on January 1, Governor Whitman of New York ordered an investigation of the activities of the two Public Service Commissions of New York State. The outcome of this investigation will be awaited with interest by all who are interested in the public utilities of New York, most of which are operated electrically.

The Public Service Commission of New York has ordered that the maximum electricity rate of the Westchester Lighting Co., in White Plains, Port Chester, Tarrytown, North Tarrytown, Irvington and East Chester is excessive, unreasonable and unjust, and shall be reduced from 15 cents a kilowatt hour to 12 cents, and that the minimum monthly rate of $1 is excessive and should be reduced to 75 cents. The Westchester Lighting Co. cases have been pending for a long time before the commission, and have attracted considerable attention as among the most important lighting cases to come before the commission recently.

The report of the Maryland Public Service Commission to Governor Goldsborough for the year 1913 was made public a few weeks ago. It was an interesting and exhaustive statement of the work of that body and gives a clear idea of the scope of regulation of public utilities in Maryland. There are 203 corporations under the jurisdiction of the commission, or one less than in 1913. Of these 4 are express companies, 36 electric light companies, 18 gas and electric light companies, 15 gas companies, 24 electric railway companies, 2 telegraph companies, and 20 telephone companies. The total capital stock of these corporations is $741,882,719; the total funded debt, $830,260,936, making the total capitalization, $1,572,143,655, which is $83,696,316 more than in 1913.

Utilizing City Water Service Run-Off for High Tension Electricity Supply

The utilization of the output of reservoirs that supply water to the Metropolitan District centering in Boston, for the generating of electrical energy, was first undertaken about three years ago, when the State of Massachusetts, through its Metropolitan Water and Sewerage Board, installed a generating station at the Wachusett dam, in the town of Clinton, Mass., and entered into a contract with the Connecticut River Transmission Co. for the supply of electrical energy for five years.

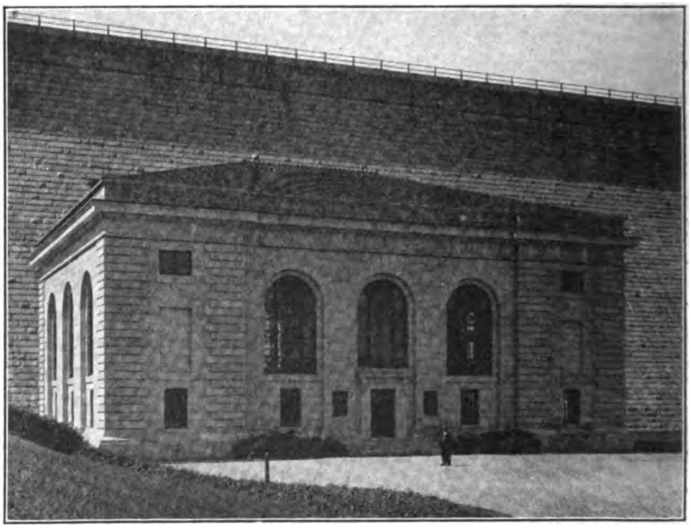

Wachusett dam and reservoir. Power station at foot of dam. Metropolitan Water and Sewerage Board of Massachusetts.

Now, a second utilization of the water supply is to be made, at the dam of the Sudbury reservoir, into which the Wachusett reservoir discharges. The same waters will thus be harnessed twice in succession before they proceed to the pumping station whence the district's mains are supplied. The energy generated at the Sudbury dam station will be delivered to the Edison Electric Illuminating Co., of Boston, under the terms of a five-year contract.

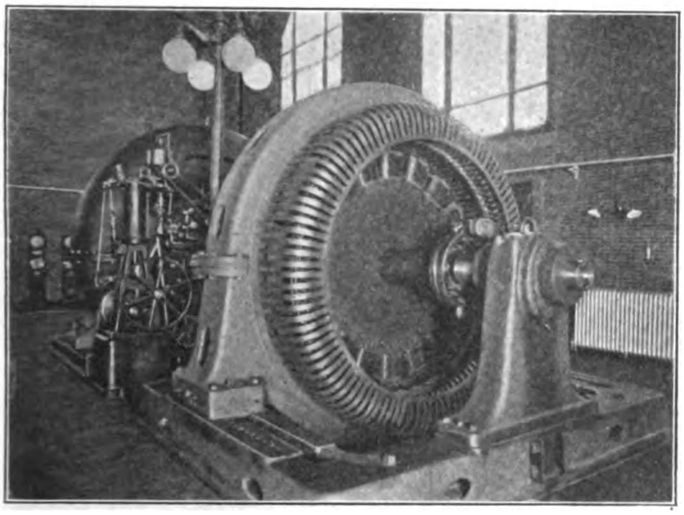
The Wachusett reservoir is an artificial enlargement of the Nashua River and has an area of 4,150 acres and a capacity of about 65 billion gallons. The dam at the lower end of the reservoir is of massive granite rubble masonry, faced with ashlar. It is 944 feet long, with the abutments, and 207 feet high at its maximum, and the thickness at the base is 185 feet, diminishing to 22.5 feet at the top.

The power house, at the foot of the dam, serves as a gate chamber for the control of the water to the aqueduct, as the office headquarters of the Wachusett maintenance department, and as the generating station. The building is 104 ft. 6 in. long, 74 ft. wide and 59 ft. high to the ridge of the roof. The outside walls are of Chelmsford granite, and the roof of red Spanish tiles. The interior is divided into the generator room, 74 ft. by 64 ft., and 39 ft. high; a room for the exciters; an aqueduct gate chamber, and several rooms used as offices and for storage. The floor of the operating room is laid with red tiles.

The generating room rests on the concrete arches of a chamber 34 by 74 ft., which provides for the water passing from the turbines. In the generator room are installed four S. Morgan Smith scroll-case turbines which operate on a head varying from 80 to 100 ft., at a speed of 400 r.p.m. Each unit contains a 30-in. type K runner. The intake to each scroll case is a 48-in. iron pipe and is connected with a vertical masonry chamber in the dam and a well 7 ft. in diameter which extends downwards in the dam to a depth of 111 ft. below the maximum water level of the reservoir. A 48-in. cast iron pipe connects the foot of the well

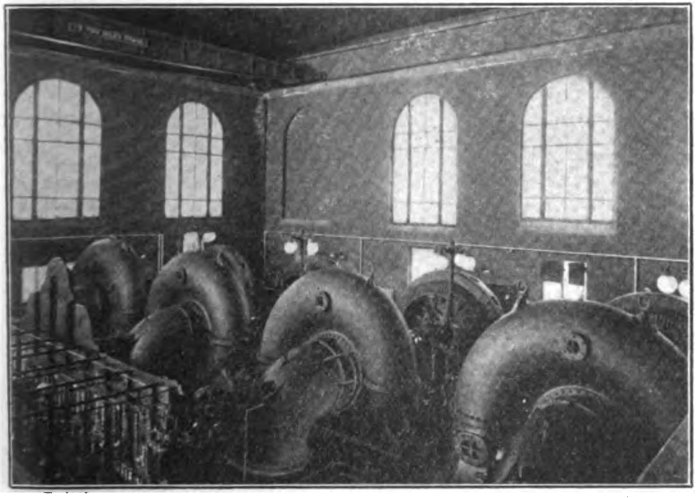

Gatehouse and power station, Wachusett dam, Clinton, Mass. Metropolitan Water and Sewerage Board of Massachusetts.

with the penstock in the basement of the station and after increasing to a diameter of 60 in., a 60-in. pipe diminishing to 48 in. leads vertically to the turbine above. From each pipe line are two 24-in. branches which allow the water to pass to the aqueduct without reaching the turbines. The gates are controlled by type Q Lombard governors operated by motors controlled on the switchboard. The turbines are each controlled by a type Q Lombard governor. The discharge is by way of draft tubes located in the chamber beneath the generator room floor. Thence the water flows to the Wachusett aqueduct, which has a capacity of 360,000,000 gallons a day.



Governor, turbine, and generator. Wachusett dam generating station of Metropolitan Water and Sewerage Board of Massachusetts.

Directly connected with each of the four turbines is a 1,000-kva. horizontal-shaft Westinghouse alternating-current generator, providing 3-phase, 60-cycle energy at 13,800 volts, the same potential as that of the Connecticut River Transmission Co.'s lines, with which the station is connected. The generators were tested for an overspeed at 800 r.p.m. with full field current, and the result was a terminal voltage of 35,900 without sign of breakdown.



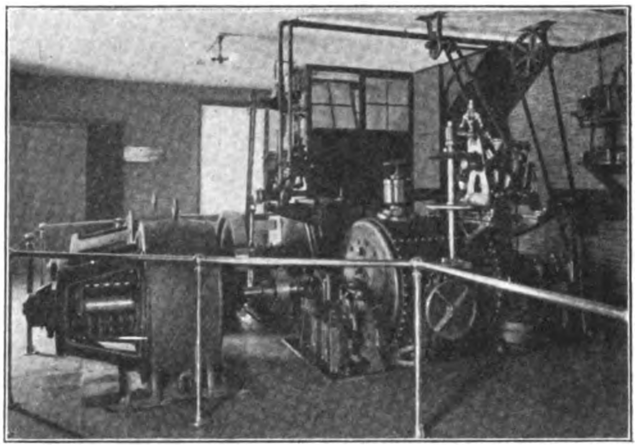
Smith turbines driving Westinghouse generators. Wachusett dam generating station of Metropolitan Water and Sewerage Board of Massachusetts.

In the separate room mentioned are located two horizontal-shaft water wheels operating exciters. One is of Morgan Smith manufacture, rated 110-h.p. at 1,000 r.p.m., and the other is a Holyoke turbine capable of developing 100 h.p. at 1,100 r.p.m. Both operate under a normal head of 90 ft. and the two units are controlled respectively by a type F Lombard governor and one of the mechanical type.

Directly connected to the shaft of each water wheel is a 60-kw. direct-current Westinghouse exciter, shunt wound and operating on 125 volts. Each unit is sufficient to excite all four generators.

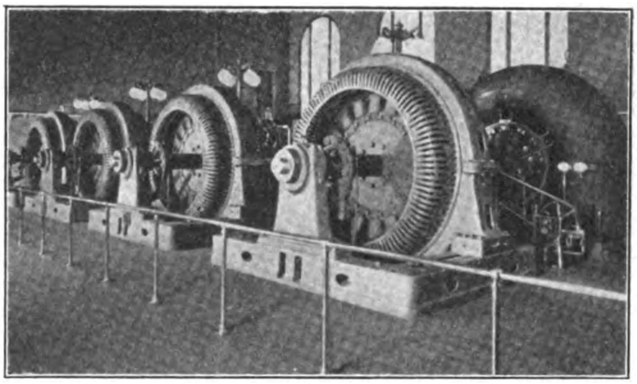
Through the concrete foundations of the building Sherarduct iron conduits, varying from ½ to 3 in., were laid during the process of construction. These contain the lead-covered cables which connect the generators and the switchboard, the light, power, telephone, and bell wires. The conduits were furnished and installed by the M. B. Foster Electric Co., Boston, Mass.

The switchboard consists of eleven slate panels and is set 12 ft. from the rear wall of the generator room, with a supporting framework of 1¼ in. iron pipe. The board consists of four generator panels, two exciter panels, one carrying a Tirrill regulator, a total-load panel, a line panel with volt meters and frequency indicators on the feeder lines, a panel to be given to the control of motors to be installed on the sluice gates, and one blank panel, now used for instruments on the sewage pump.



Water-wheel driven exciters. Wachusett dam generating station, Clinton, Mass.

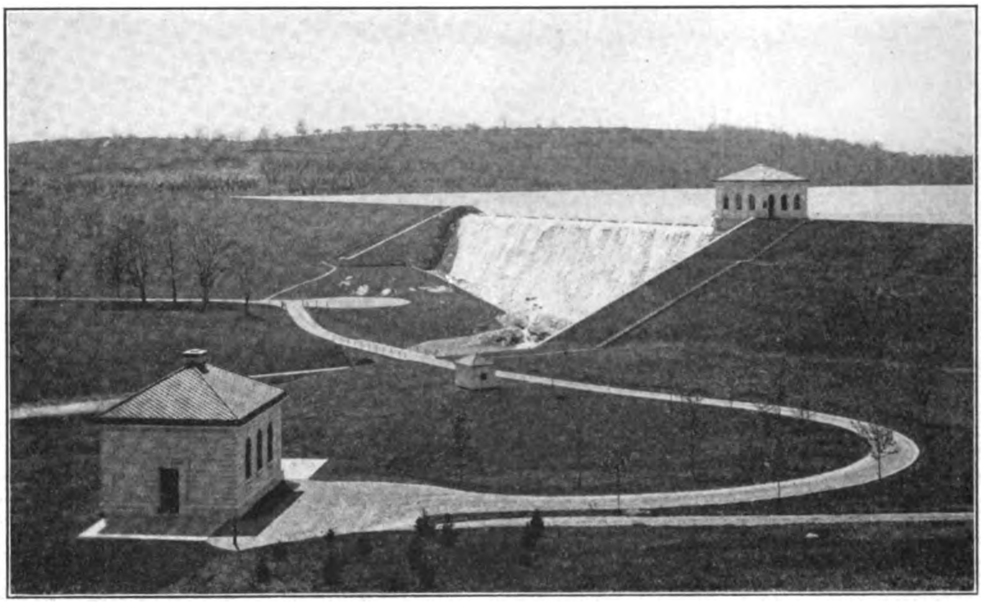
On the wall at the rear are located the current and potential transformers, oil and disconnecting switches, and the high-tension bus. The oil switches and the two oil circuit breakers for the outgoing lines are in separate asbestos board compartments.



Four Westinghouse generators in Wachusett generating stations of Metropolitan Water and Sewerage Board of Massachusetts.

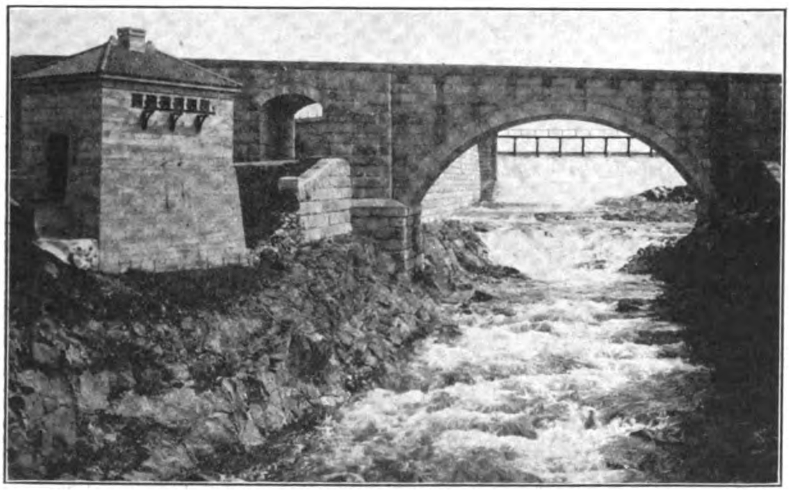
In connection with each of the circuit breakers are two single-phase overload inverse time relays. Three 25-kw. oil-insulated transformers are connected to the high-tension bus in such a manner as to provide for energy at the station from the Connecticut River Transmission Co.'s lines when the station is not in operation.

The transmission line connecting the station with the transmission company's system is installed underground for a distance of about 815 feet, in two lead-covered cables contained in two 3.5-in. Orangeburg fibre conduits laid in Portland cement concrete. At intervals are manholes to facilitate the pulling in of cables. The latter were furnished and installed by the Standard Underground Cable Co., of Pittsburgh, Pa. They are composed of three paper-insulated conductors each of 19-strand copper wire equalling No. 0, B. & S. gage, and were tested for 30,000 volts pressure.



Sudbury dam and gatehouse to be used as an electric generating station. Metropolitan Water and Sewerage Board of Massachusetts.

The lightning arresters were installed at the end of this underground line in a concrete substation 20 ft. long and 14 ft. wide, with tile roof. The arresters are of the electrolytic type and are provided with choke-coils and horn gaps. The cables are connected to the choke-coils and run thence to the overhead outgoing line through disconnecting switches, which allow either cable to be connected to either of the overhead circuits or the two cables put in parallel to feed one of the overhead lines.



Lightning arrester station, Wachusett dam hydroelectric generating station, Metropolitan Water and Sewerage Board of Massachusetts.

Connecting the lightning arrester station with the transmission company's lines, a distance of about 600 ft., is an overhead line of six No. 1 stranded bare copper wires on 35-ft. wooden poles. At the junction tower disconnecting switches are installed.

The total cost of the machinery and installation was about $100,000. The cost of the station is not reckoned in the outlay. The lightning arrester station cost about $2,500, the transmission lines about $5,000, and the 20-ton traveling crane serving the generator room $2,100.

By the terms of the act giving the board power to undertake electric generation, the industries of Clinton are given first opportunity to secure the energy supply. The Connecticut River Transmission Co. therefore supplies a part of its energy to the Lancaster cotton mills, in Clinton. The contract price for the energy furnished the transmission company is 53 mills per kilowatt-hour. In 1914 the gross income to the State was about $37,000, a total output of 7,000,000 kilowatt-hours being delivered. After paying operating expenses and taxes levied by the town of Clinton on $125,000, the net income is about $25,000 a year, but this amount is subject to a considerable reduction for interest, depreciation, and insurance.

Last year, 98.4 per cent. of the water drawn from the Wachusett reservoir was used for operating the turbines in the station. The two years previous the percentage was 79.9 and 83.2, respectively. A conspicuous advantage in the present mode of utilizing the energy is the fact that the Connecticut River Transmission Co.'s large generating stations on the Deerfield and Connecticut rivers (described in previous articles) can be operated at maximum capacity in seasons of high water when the draft on the Wachusett reservoir is at a mimimum, the supply being taken from reservoirs nearer Boston, while the demands on the Wachusett basin in seasons of drought cause a larger volume of water to be drawn from this source than at other times; hence the greater volume of power generated at these seasons of greatest demand on the part of the customer.

The plant is operated by employees of the board, and since the contract calls for the delivery of energy during a part of the 24 hours, under normal conditions, two 8-hour shifts are required. The contract guarantees a total yearly use of 5,250,000 kilowatt-hours, and a minimum use of 17,500 kilowatt-hours for the Lancaster mills when they are in operation. A provision of the contract stipulates that the State shall operate its plant at times when the company desires the energy, and that the maximum amount and the best practicable service shall be rendered without interfering with the requirements of the Metropolitan District, in its water supply.

The running times and the rate of output are subject to orders from the chief dispatcher of the transmission company. The success of the undertaking has been amply demonstrated by the three and one-half years of the plant's operation.

Following the same lines as those on which the Wachusett plant was inaugurated, the Metropolitan Water and Sewerage Board is about to undertake the development of the Sudbury reservoir, a basin lying to the east of the Wachusett, and nearer Boston. This lower basin receives the water as it is discharged from the Wachusett aqueduct.

The Sudbury reservoir has a capacity of 7,250,000,000 gallons. The outlet of this basin is by two masonry aqueducts to the Weston aqueduct, which leads to the Chestnut Hill pumping station, and by a third aqueduct leading to Framingham reservoir No. 3.

The dam and outlet are in the town of Southboro, about 25 miles west of Boston. The gate house, a substantial masonry building located on the embankment flanking the dam, will be remodeled and adapted to the uses of a generating station. In it will be located one 900-kva. and two 275-kva. vertical shaft, alternating-current generators driven respectively by a 1,000-h.p. turbine and two of 300 h.p. each, located in masonry wells which provide outlets to the Framingham and the Weston aqueducts, respectively. The head under which the layer unit will operate will be 60 feet, and on the two smaller units about 35 feet.

Approximately 90 per cent. of the total flow of the water will be utilized for power development, and it is estimated a total of 3,000,000 kilowatt-hours of energy a year will be generated. Water may be drawn from the Wachusett reservoir to replenish the Sudbury basin at such times as it may be to the best advantage.

Energy will be generated at 13,200 volts and delivered to the Boston Edison company on a 5-year contract beginning July 1, 1915, when it is expected the plant will be in readiness to begin operating. The rate to be paid by the Edison company is 6 2½ mills per kilowatt-hour. The contract calls for the delivery of energy 16 hours a day, except Sundays and holidays, with such reservations as may protect both parties.

A transmission line about 3,000 feet long will be built by the board, to the boundary of the State reservation enclosing the Sudbury basin. For a distance of 600 to 800 feet the line will be carried in underground conduit, to the opposite end of the dam from the station. Thence a pole line of native chestnut will be erected and the wires installed, about a half mile to the bound of the State property. From this point the Boston Edison company will build a transmission line about 6.5 miles to its Hopkinton sub-station. The poles will be of wood. A part of the line will run on private right of way, and a part will follow the highway. A three-wire line of No. 2 bare copper will be installed, to transmit energy at the generated pressure, 13,200 volts, which corresponds with the potential of the company's transmission line now supplying the territory.

The Hopkinton station is 43 miles from the South Boston steam generating station of the Edison company, and the connection with the State's plant will furnish an obvious advantage in affording a means of compensating for the excessive drop of potential under maximum load, and will insure continuity of service to the whole district with which the new line will be tied in.

An average of 650 kilowatts is the estimated output available at the Sudbury station, but a maximum of 1,400 kilowatts can be readily generated under proper conditions.

The engineer of the Water Board points out that while the supply of water to the Metropolitan District is the primary objective, the utilization of the run off for electric generation is a practical means of adding to the State's revenue, without diminishing the supply for domestic consumption. The value of water for generating purposes is about $1 a million gallons, while for city supply the value is between $30 and $40 a million gallons.

When the Sudbury plant is in operation the waters will be utilized twice for electrical energy, thereby doubling their value from that source, and the full value of the supply not diminished. Among the large users of water in the District is the Edison company itself, in the boilers of its South Boston station, where it is converted into steam for the generating of electrical energy.

In course of time, Boston's high-pressure fire pumping system is likely to be included in the list of operations performed with Edison service. Thus the circle of operations which the use of electrical energy performs, is constantly being widened.

Electrical Manufacturers Organize

Representatives from a number of the electrical manufacturing companies held a meeting at the Hotel Biltmore, New York, about the middle of last month to discuss the plan of forming an organization of manufacturers whose purpose would be to deal with problems of a general nature that might arise from time to time in the industry. R. K. Sheppard, of the B. F. Goodrich Co., Akron, Ohio, acted as chairman of the meeting, H. R. Sargent, of General Electric Co., as secretary. Talks with those present gave the impression that the gathering of the electrical manufacturers, and the suggestion to form an organization, was due to the situation caused by some of the statements made at the concentric wiring conference late in December. Representatives of the large manufacturing companies present, however, were of the opinion that an organization composed of manufacturers should take a large view of things, and consider problems of a general instead of a specific nature. After some discussion it was decided to turn the matter of organizing over to a representative committee of nine. This committee will report at a general meeting to be held in the future. It was also decided to appoint a committee to investigate the details of the concentric system wiring and the systems in use in this country at the present time. The report of this committee will be awaited with interest.

It was the sense of the meeting that the committee on organization report at a general meeting to be called on February 9 to which electrical manufacturers from all over the country would be invited.

TECHNICAL SCIENTIFIC — FINDINGS — PHILOSOPHICAL THEORETICAL

At a meeting of the Academy of Medicine in Paris on January 13, Dr. Lesage recommended a novel method for reading print for the use of those who happen to have forgotten their spectacles. The method is to take a piece of paper and perforate it with a pin, thus making numerous small holes. The paper must be held close to the eye and the reading matter at a distance from the eyes. We have tried it. It works. The type appears magnified several diameters.

Many rare minerals exist in Tasmania and a new addition has been made to the list by the discovery of molybdenite, which is used in the manufacture of molybdenum steel, to which it imparts special hardness and toughness. As the present price of the mineral is about $2500 per ton, this discovery should prove of considerable value.

In the metallurgy of nonferrous metals the electric furnace has had a greater application for the treatment of zinc ores than in the metallurgy of any of the other nonferrous metals except aluminum. Since 1885, when an electric furnace for the treatment of zinc ores was patented by the Cowles brothers, experimental work has been done. However, the process has not been applied to any great extent because of the difficulty of condensing the zinc vapor produced in smelting in the electric furnace. The cause of this difficulty has not yet been definitely determined. With few exceptions the work has not been done on a very large scale, and so it may be said that the electric smelting of zinc ores is still in the experimental stage.

Light, according to the undulatory theory, is a sensation produced on the retina of the eye by a wave motion of the ether, all light travelling with the same velocity, the difference in color sensation being due to differences in wave-length and frequency.

Boxmakers in the United States use more than four and a half billion board feet of lumber each year, or more than one-tenth of the entire lumber cut of the country.

Recently the electro-deposition of nickel has received much more attention than was formerly the case. Printers have realized that it pays to nickel-plate electro- and stereo-types, and the result is that there is an increasing demand for small electro-depositing plants which is not at present adequately met. The advantages from the printers' point of view of nickel-plated blocks are that the metal is non-oxidisable, it is practically as hard as hardened steel, it takes ink well, and gives off, as it is termed, much better than copper. In many of the red and other inks used by the printer mercury occurs, and whilst this substance attacks copper it has no effect on nickel. Another advantage is that it sharpens up work. Every printer who has a knowledge of photogravure work and has examined closely prints of a plate before and after facing, will quite understand the difference nickel-plating can make to a good half-tone block or electro.

Extensive deposits of potassium sulphate and carbonate have been discovered near Condona, 40 miles northwest of Barcelona. The deposits are of great thickness and begin about 200 feet below the surface.

When sand, sawdust, and coal are heated together in an electric furnace at a high temperature, a carbide of silicon is formed which is known as carborundum. This carborundum may be crushed and made into brick by mixing the crushed product with a suitable binder, such as tar, glue, or sodium silicate. The fusing point of carborundum itself is about 2,200° C.

The best excelsior is made from basswood or linden. Aspen and cottonwood, however, supply nearly half of the total amount manufactured.

High-speed steels contain as much as 24 per cent. tungsten and 0.40 to 0.80 per cent. carbon. These steels do not lose their temper or toughness at a red heat, so that they are adapted for tools to be used for high-speed cutting. In the steel for cutting tools the tungsten may be replaced by one-half as much molybdenum. In this way 6 to 15 per cent. molybdenum is used. A little vanadium can be added with beneficial results.

Clerk Maxwell, said a speaker at a recent I. E. S. meeting, has shown that all color combinations may be reproduced by a mixture of not more than three primary colors, red, green, and blue. Painters and printers are accustomed to regard red, yellow, and blue as the three primaries, but this is due to their working with the subtractive method of color combination, where colors are laid one on top of another so that the resultant color is the original or light source color, less all of the colors which the various color layers have the property of absorbing. In addition to the subtractive method of color combination, there is the additive method by which the final net result is the sum of all the color components used. While most painters use the subtractive method, there is a school of painting in which the color is laid on in the form of little dots arranged side by side. This additive process gets its color combination from the inability of the eye to distinguish minute objects distinctly at a distance, the dots merging and forming a combination image of a color resultant which is the sum of all the colors of adjacent dots.

High Tension Materials and Fittings

(HIGH TENSION SERIES—ARTICLE NO. 1)

High tension is said to be "a circuit used with high electric pressures." More specifically it might be said that high tension is any pressure above 3,000 volts, for according to the National Electric Code, voltages from 300 up to 3,000 are "high potential circuits."

In this and succeeding articles on high tension which are to appear each month in the ELECTRICAL RECORD, it is purposed to describe and illustrate the numerous materials and fittings made for installation on systems employing voltages of 3,000 volts and upwards. It is the intention to treat of high tension materials and fittings from a commercial standpoint only.

Most of the high tension systems now operating, particularly those having pressures of 10,000 volts and upwards, are hydroelectric projects; that is, the generator is operated by means of a waterfall. The principal features of such hydroelectric generating and transmission systems—what goes up to make up the system from the impounding of the water to the final distribution—are: storage reservoir, dam, spillway, head gate, flume or intake canal, head race, forebay, intake gate valve, penstock or pressure pipe, power house, draft tube, tail race. transformer house, transmission line, substation, trolley feeder, steam reserve and substation, and distribution line. Detailed information in regard to specific installations have been described from time to time in the ELECTRICAL RECORD, in which details have been given as to the method of operation, and so forth. It is the intention in these articles to go still further and describe and show the materials and fittings used, and as far as possible just where and why they are used.

The electrical features of a high tension transmission system are mainly in connection with the generation, transmission, and distribution of current. This makes necessary a power house, transformer house, substation, steam reserve and substation (in many cases), transmission line, and distribution line. The devices used in connection with these parts of a system may be classed as line material, substation equipment, and station fittings. These are the devices that are to be described and illustrated. In this first article it is proposed to start with line materials, and these materials will be described and illustrated in succeeding articles until the list of such materials is exhausted. Then will follow substation equipment, after which the subject of station fittings will be taken up.

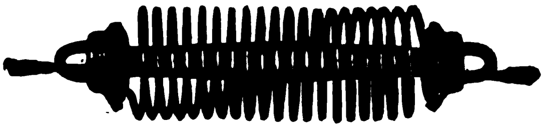
LINE MATERIALS

Line materials are those devices and apparatus that form part of the transmission and distribution end of a high tension system. These materials include:

Arms
Braces, cross-arm
Brackets
Cable terminals
Choke-coils
Disconnecting switches
Fuse blocks
Fuses
Grounding devices
Guy rods
Insulators
Lightning arresters
Mast arms
Oil break switches
Pins
Poles
Poletops
Potheads and sleeves
Rods
Towers
Wire.

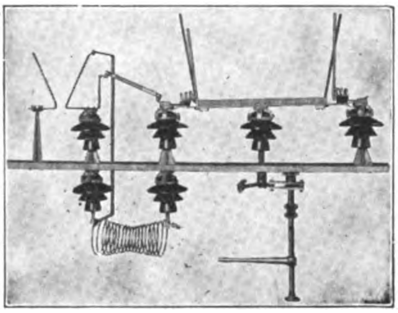
The names of the manufacturers of these materials will be found in the Directory of Manufacturers published regularly in every number of the ELECTRICAL RECORD, under proper headings.

The materials above mentioned need very little mention as their uses are evident. A number of them are illustrated, the captions under each cut containing data as to what the device is, what it is used for, and who makes it. In the succeeding article, to be published in the March issue of the ELECTRICAL RECORD, more definite information in regard to their use will be given, and the illustrations continued. It is the intention, however, to make the pictures tell the story.

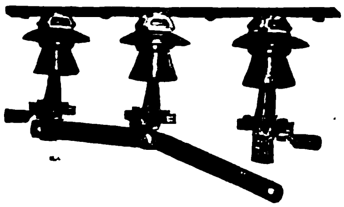


50-100 ampere, 25,000 volt, suspension type choke coil. Made by General Electric Co., Schenectady, N. Y.

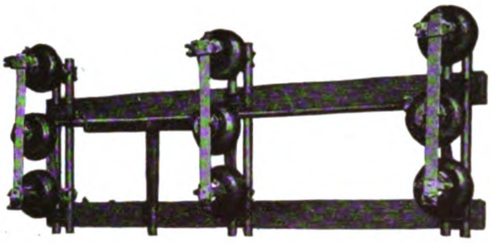
2,000 ampere, 6,600 volt, double blade, double throw disconnecting switch with locking device, mounted on marble base. Made by Electrical Engineers Equipment Co., 711-715 West Meridian street, Chicago, Ill.



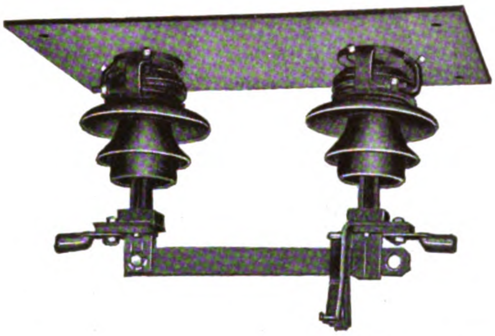
One pole protective unit or combination lightning arrester, for all circuits up to 66,000 volts; consists of a fuse, a pair of discharging horns, and a choke coil; mounted on a channel base; particularly adapted for substation work. Made by Delta-Star Electric Co., 617-31 W. Jackson boulevard, Chicago, Ill.



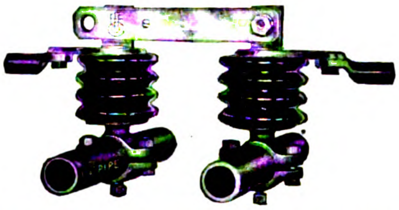
Single pole, double blade, double throw, 300 ampere 15,000 volt inverted disconnecting switch. Made by Electric Engineers Equipment Co., 711-715 West Meridian street, Chicago, Ill.



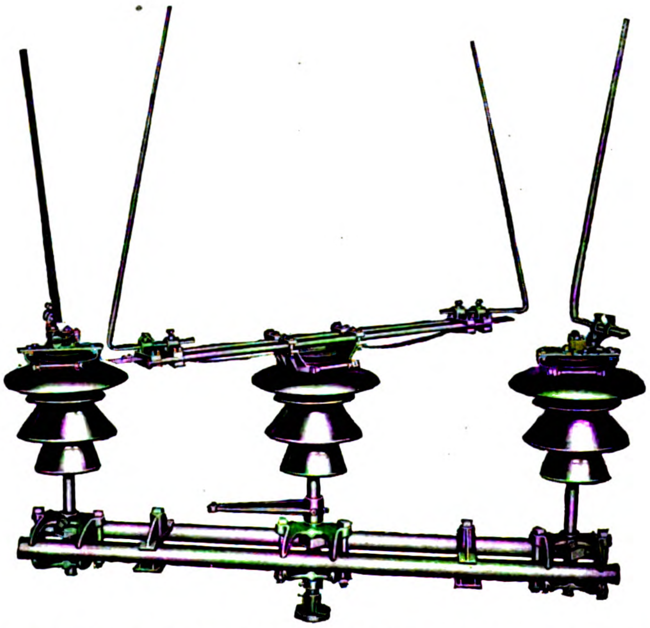
Three-pole, 22,000 volt, 100 ampere, poletop disconnecting switch, designed to meet the demand for a small group-controlled switch for installations not requiring the circuit breaking capacity of the double break type of switch. Made by Electrical Engineers Equipment Co., 711-715 West Meridian street, Chicago, Ill.



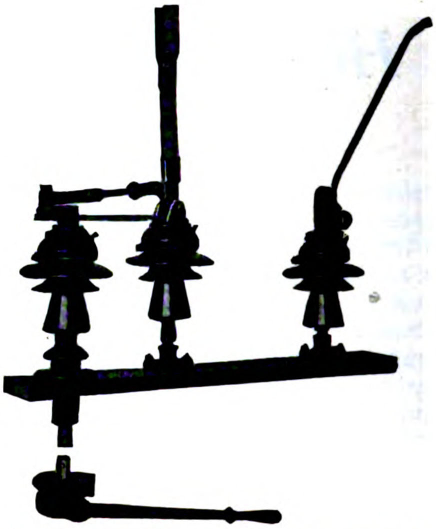
300 ampere, 35,000 volt, outdoor disconnecting switch underhung on steel base. Made by General Electric Co., Schenectady, N. Y.



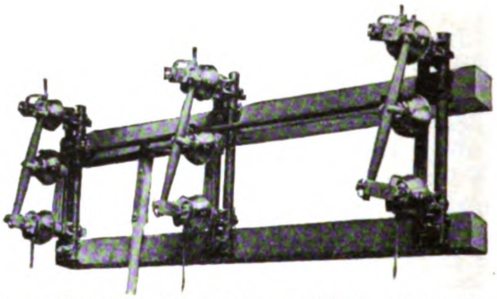
300 ampere, 6,600 volt, single pole, single throw, disconnecting switch without locking device, for pipe mounting. Made by Electrical Engineers Equipment Co., 711-715 West Meridian street, Chicago, Ill.



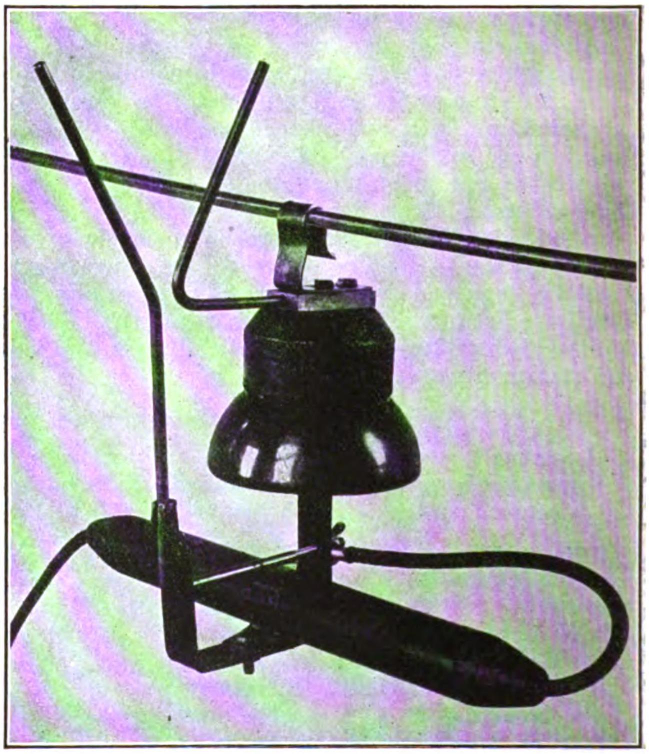
14,000 volt, 150 ampere, Baum poletop disconnecting switch, showing single pole type with discharge horns. Made by Electrical Engineers Equipment Co., 711-715 West Meridian street, Chicago, Ill.



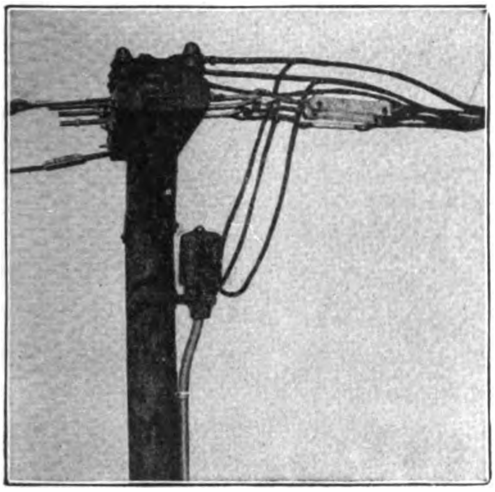
300 ampere, 45,000 volt, single pole, disconnecting switch, for pole mounting; operated from ground. Made by General Electric Co., Schenectady, N. Y.



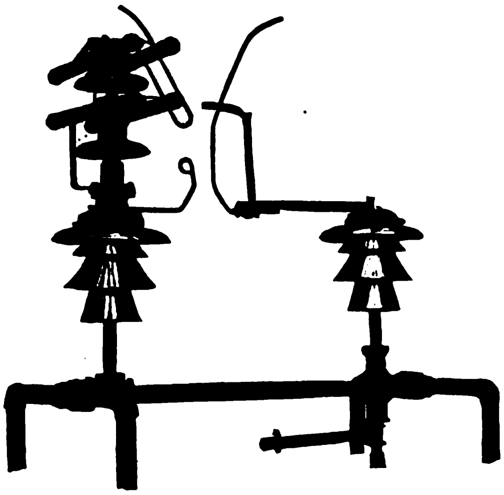
Three-pole, 15,000 volt, 100 ampere combined poletop disconnecting switch and fuse. Wooden tube fuses furnished. Made by Electrical Engineers Equipment Co., 711-715 West Meridian street, Chicago, Ill.



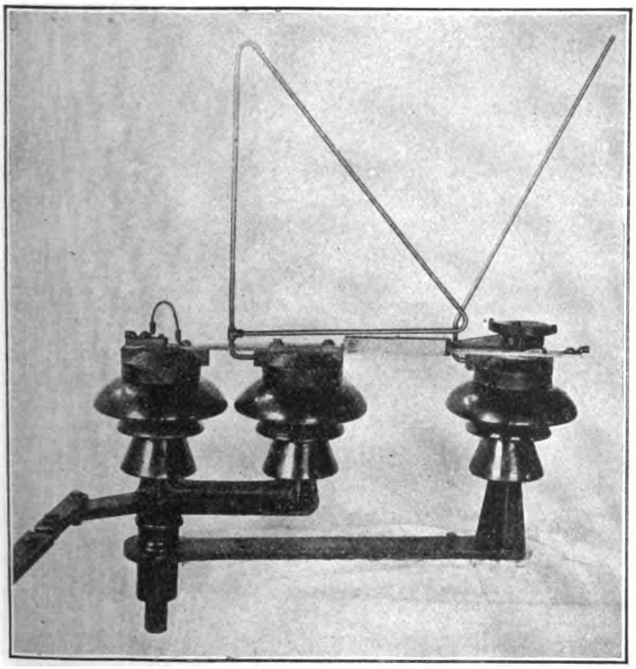
2,200-6,600 volt, suspension type, horn gap, lightning arrester with resistance in the ground circuit. This type of arrester is suspended direct from the transmission line. Made by Railway and Industrial Engineering Co., Greensburg, Pa.



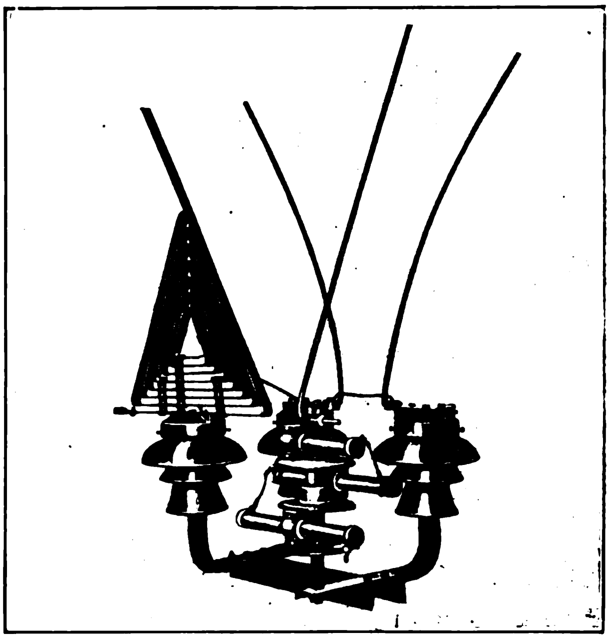
Typical installation of a three conductor all porcelain feeder pothead on feeder terminal pole, for circuits of 6,600 volts or less. Made by The Colonial Sign and Insulator Co., Akron, Ohio.



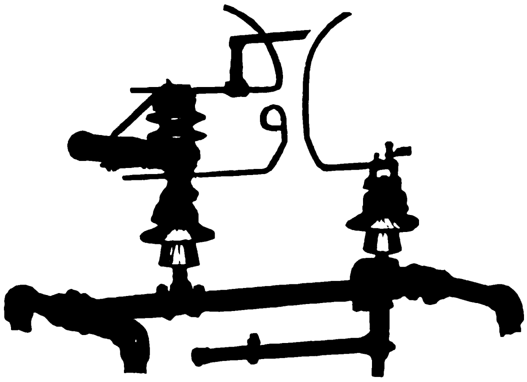
70,000 volt, horn gap with charging resistance and charging contact. Made by General Electric Co., Schenectady, N. Y.



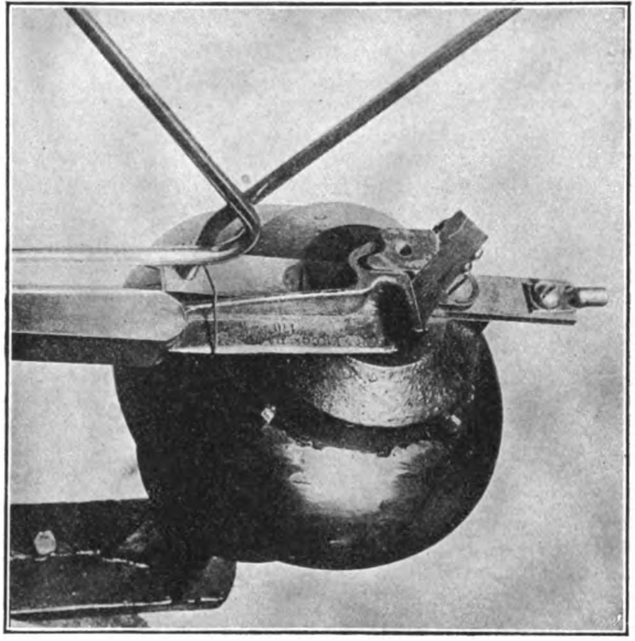
Single pole unit of horn gap switch with new butt type of contact. Made by Railway and Industrial Engineering Co., Greensburg, Pa.



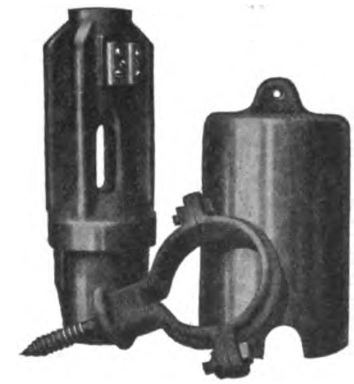
Combustion lightning arrester, choke coil, and fuse, with resistance in the ground circuit of the arrester for limiting the dynamic current to approximately ten amperes. Used on all circuits up to 60,000 volts. Made by Railway and Industrial Engineering Co., Greensburg, Pa.



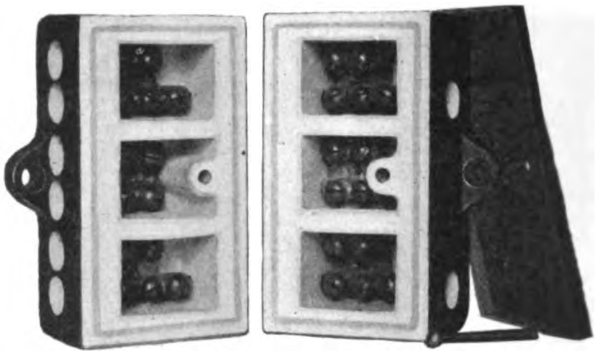
Horn gap, with charging resistance for use with 12,500 volt, aluminum lightning arrester. Made by General Electric Co., Schenectady, N. Y.



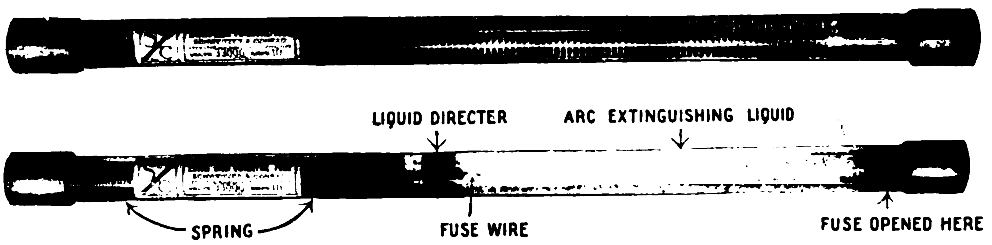
Close view of main contact of horn gap switch. Made by Railway and Industrial Engineering Co., Greensburg, Pa.



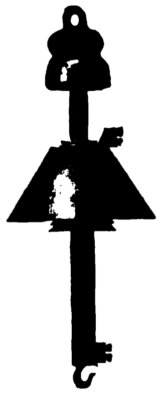
Two conductor, all porcelain pothead for distribution circuits of 6,600 volts or less; also made in three and four conductor styles; provides a dependable outdoor terminal for lead covered cables. Made by The Colonial Sign and Insulator Co., Akron, Ohio.



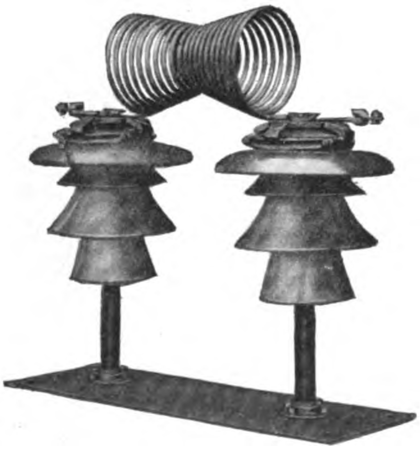
Two views of terminal block for connecting lamp post circuits to underground feeders; for high voltage series and low voltage multiple systems. Made by The Colonial Sign and Insulator Co., Akron, Ohio.



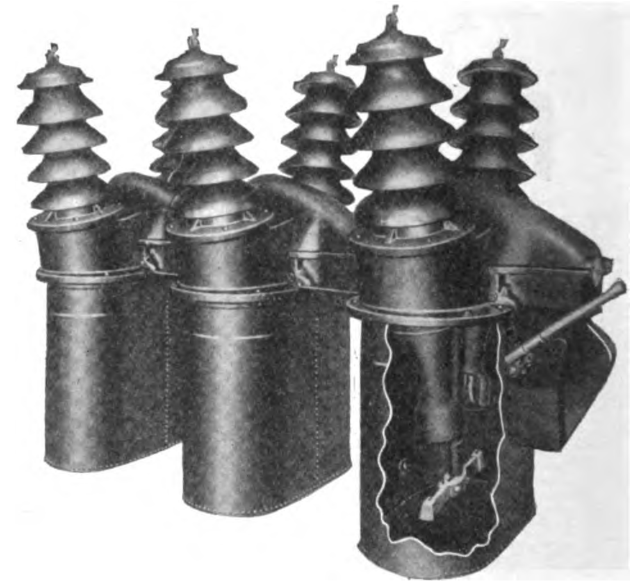
Exra high potential fuse. When blown, a transparent space is created by the contraction of a spring, thus indication is given of the condition of the fuse. Made in various sizes for potentials of from 6,600 to 111,000 volts, by Schweitzer & Conrad, 1770-1774 Wilson avenue, Chicago, Ill.



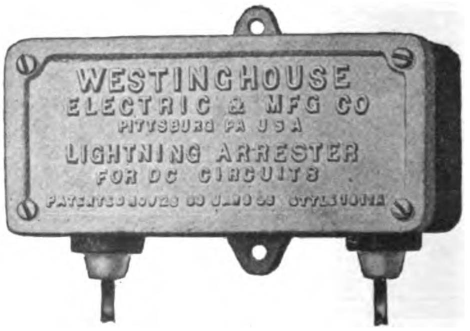
Single pole lightning arrester for single-phase, two-phase, and three-phase lines up to 6,600 volts; for 13,200 volt circuits, two arresters are used in series. Made by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



200 ampere, outdoor choke coil for 60,000 and 70,000 volt circuits. Made by General Electric Co., Schenectady, N. Y.



High voltage outdoor oil switch for 22,000 volts and upward; consists of separate single pole, top connected elements mounted in steel tanks; switch mechanism similar for each pole, and mounted on oil tank. Made by General Electric Co., Schenectady, N. Y.



Lightning arrester in weatherproof iron box, for use on d.c. series arc circuits up to 4,000 volts. Made by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

COMMON MATERIALS

SUCH AS ARE USED IN MANUFACTURING AND INSTALLING SPECIAL DEVICES. ALL NEW PRODUCTS ARE SHOWN IN THE DEPARTMENT SO NAMED.

No. 32---Washers

The dictionary definition of a washer is: "A ring of metal, leather, or other material, or a perforated disk for use around a bolt or screw to form a seat for the head or nut, or around a wagon axle to prevent endwise motion of the hub and relieve friction; in a joint as a packing."

From the foregoing it will be seen that there are very few if any strictly electrical uses for the average or common washers. There are, however, two kinds of washers that are used for electrical purposes. These are called nail head washers and spring washers.

NAIL HEAD OR INSULATING WASHERS

For stringing wires, in telephone and other work, it is often necessary to tack the wires to a wall, surbase, or ceiling. In order, however, that there shall be no danger of short circuits from the nail head coming in contact with an uninsulated part of the wire, it is necessary either to have a nail with a fibre, or other non-conducting head, or else use a washer as a seat. For this purpose a number of makes of leather and fibre washers are on the market, called nail insulating washers. The following companies make such washers:

Eureka Supply Co., Sewell, N. J.
F. S. Feeser Co., Indianapolis, Ind.
R. Hoffeld & Co., Buffalo, N. Y.
Indiana Leather Stamping Co., Williamsport, Pa.
Planet Co., Westfield, Mass.

SPRING OR TENSION WASHERS

There is no set style, kind, shape, or size of spring or tension washers; all are made to order, as the requirements vary in almost every case. One company, for instance, keeps over 750 dies for making washers of this kind, each one different from the other. These spring or tension washers are made of tempered steel, spring brass, or spring bronze, and are used almost entirely, in the electrical field, in the construction of knife switches, to make a tension in the hinges of the blades. The following companies make spring or tension washers for this purpose:

Wallace Barnes Co., Bristol, Conn.
Kales-Haskel Co., Detroit, Mich.
Metal Products Corporation, Providence, R. I.

A large use for spring washers outside of the electrical trade is in connection with automobiles, and probably represents the largest use.

Telephoning from the Atlantic to the Pacific

On January 25, the new trans-continental telephone line connecting the Atlantic Coast with the Pacific Coast was opened for temporary operation. By way of celebrating this important event—the most important the electrical industry has known for many a year—the American Telephone & Telegraph Company issued invitations to representative scientists, engineers, publicists, bankers, and men well known in public and commercial life, to attend the opening exercises in the directors' room at 15 Dey street, New York. The guest of honor was Dr. Alexander Graham Bell, the inventor of the telephone. Grouped with Dr. Bell at the Atlantic end of the trans-continental line were U. N. Bethell, vice-president of the American Telephone & Telegraph Co.; J. J. Carty, chief engineer; George McAneny, president of the Board of Aldermen of New York; Mayor J. P. Mitchel, of New York; Pres. Yost. of the Nebraska Telephone Co.; and Comptroller W. A. Prendergast, of New York. Theodore N. Vail, president of the American Telephone & Telegraph Co. was at his winter home on Jekyll Island, off the coast of Georgia, but was connected in circuit throughout the afternoon and thus took an active part in all that went on.

The line connecting New York with San Francisco passed through Philadelphia, Washington, Pittsburgh, Chicago, Omaha, Denver, Cheyenne, Salt Lake City, Winnemucca, Reno, and Sacramento—a total of 3400 miles one way, or 6800 miles of metallic circuit. The line that connected Jekyll Island with San Francisco added another 1100 miles to the circuit. The opening message was sent by Dr. Bell, at the New York end, to Thomas A. Watson, at San Francisco. Both Dr. Bell and Mr. Watson talked through replicas of the original transmitters used by them when the first telephone message was sent over a line 40 feet long in Boston in June, 1875. Due to the many line improvements made since that time, the old instruments performed better at 3400 miles than they did 40 years ago at a distance of only 40 feet.

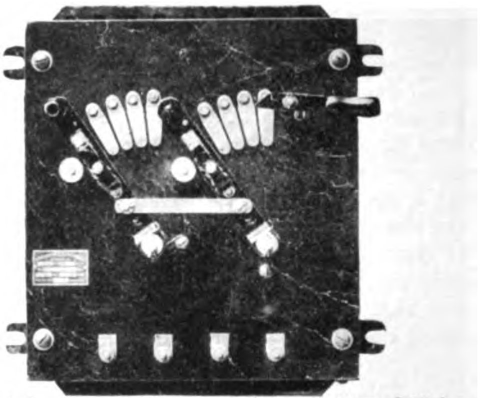
The line through Washington passed through the executive offices in the White House. During the afternoon President Wilson talked with President Moore of the Panama-Pacific Exposition and with Mr. Watson, at San Francisco, with Mr. Vail at Jekyll Island, and with Dr. Bell, at New York. President Wilson congratulated Dr. Bell on the outcome of his remarkable invention. In reply, Dr. Bell told the President that the credit for the success of the telephone should not be given to him alone, but also to all the other men who had worked on it. "The telephone," he said, "is not the product of one mind, but of many minds." Following these talks there were short talks between the city officials of New York and San Francisco. Then J. J. Carty talked with Thomas B. Doolittle, a telephone pioneer, in San Francisco, and Union N. Bethell talked with George E. McFarland, president of the Pacific Telephone & Telegraph Co. Later in the day the mayor of Boston talked with Mayor Rolph, of San Francisco. During these talks all those present had an opportunity to listen to what was going on between New York, Washington, Jekyll Island, and San Francisco, the circuit being tapped for that purpose by means of several hundred small receivers. Those who had this privilege heard the voices in far away San Francisco quite as clearly as if they were in the immediate neighborhood.

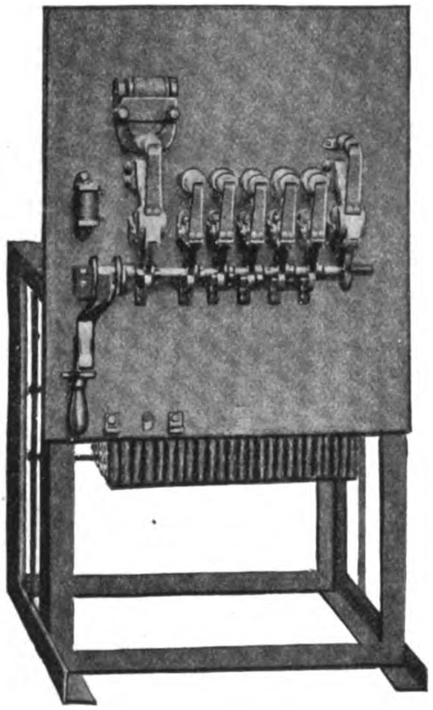
SPECIAL DEVICES

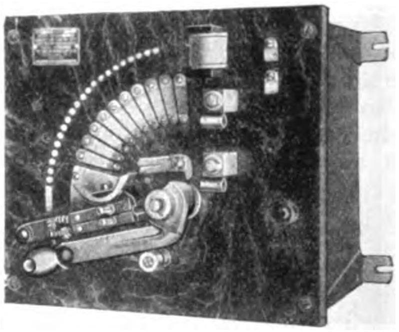
SHOWING ALL TYPES WITHOUT REGARD TO TIME THEY HAVE BEEN ON THE MARKET. ALL NEW PRODUCTS ARE SHOWN IN DEPARTMENT SO NAMED.

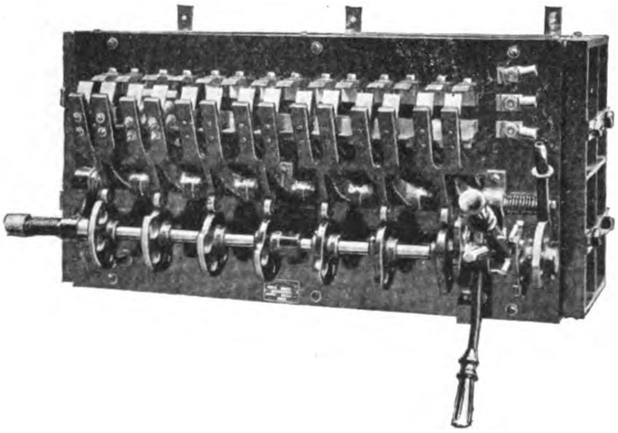
No-26 Rheostats (*Continued*)

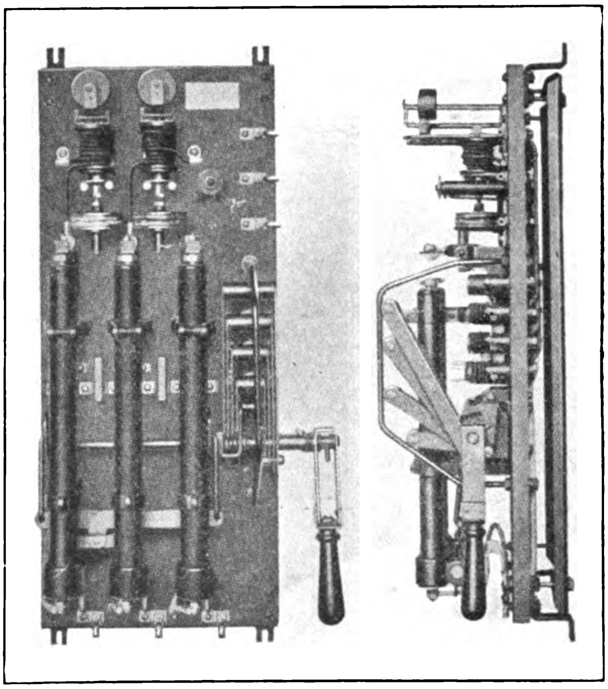
In the previous installment of this article, illustrations of a number of types of various makes of field, motor starting, battery charging, and load or meter testing rheostats were omitted as the illustrations were not available at the time of going to press. Illustrations of a number of these types follow. These together with the pictures shown in the previous installment will serve to give an adequate idea of the kinds, types, and makes of rheostats, now on the market and the purposes for which they are used.


Starting rheostat for 2 or 3 phase squirrel cage motors, 5-30 h.p., 110, 220, and 440 to 500 volts; hand release. **Made by Industrial Controller Co., Milwaukee, Wis.**


Heavy duty starter for d.c. motors of large size or smaller motors starting under heavy load; particularly suitable for motors driving pumps, fans, boring mills, and planers. Made by The Cutler-Hammer Mfg. Co., Milwaukee, Wis.


Compound starter with no-voltage release for 115, 230, and 500 volt d.c. motors, with speed variation from 2 to 1 to 4 to 1; a combination of armature resistance for starting duty and shunt field resistance for speed regulation. Made by The Cutler-Hammer Mfg. Co., Milwaukee, Wis.


Multiple switch starter with hand release, for 60-600 h.p., slip ring, a.c. motors. Made by Industrial Controller Co., Milwaukee, Wis.


Resistance starting switch, 1-30 h.p., 220-550 volt, 25 to 60 cycle, equipped with no-voltage release. Made by Allen-Bradley Co., 495-497 Clinton street, Milwaukee, Wis.

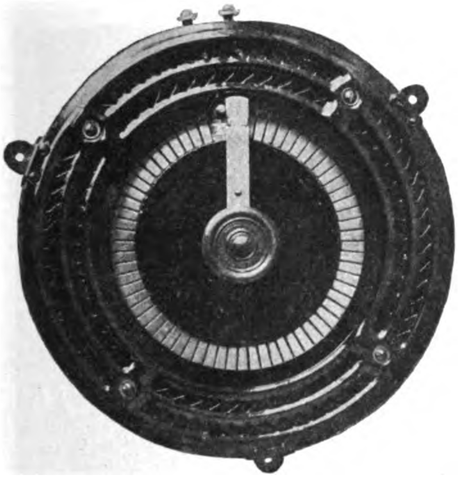
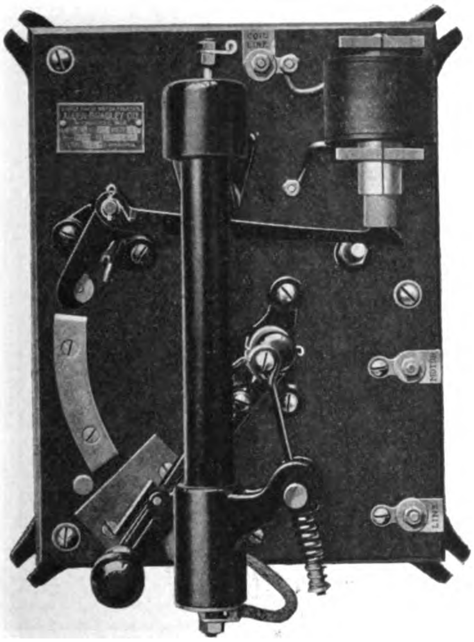
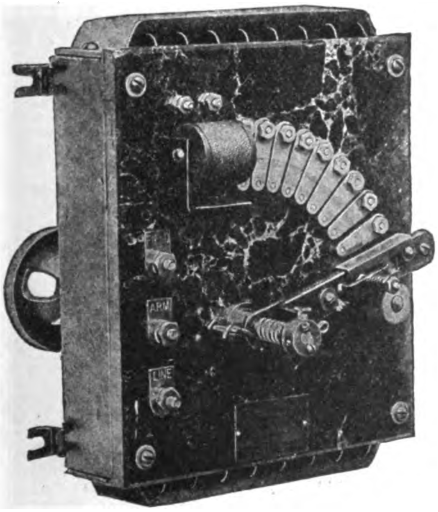


Plate type, field rheostat for from 30 to 750 volt circuits, with resistances up to 4 times resistance of field; in three sizes, 9, 12, and 15 inch plates. Made by The Cutler-Hammer Mfg. Co., Milwaukee, Wis.

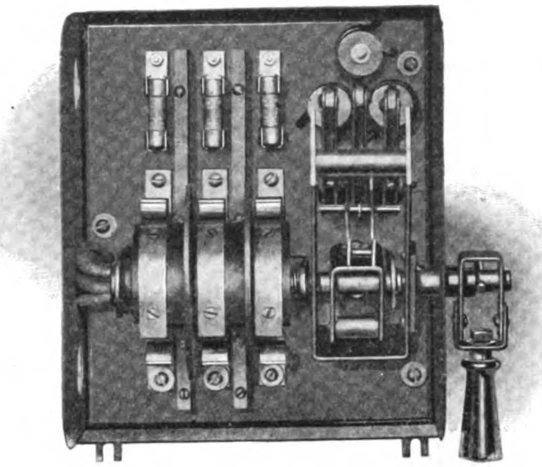


10 h.p., 220 volt, single phase, a.c. motor starter with automatic no-voltage release. Made by Allen-Bradley Co., 495-497 Clinton street, Milwaukee, Wis.

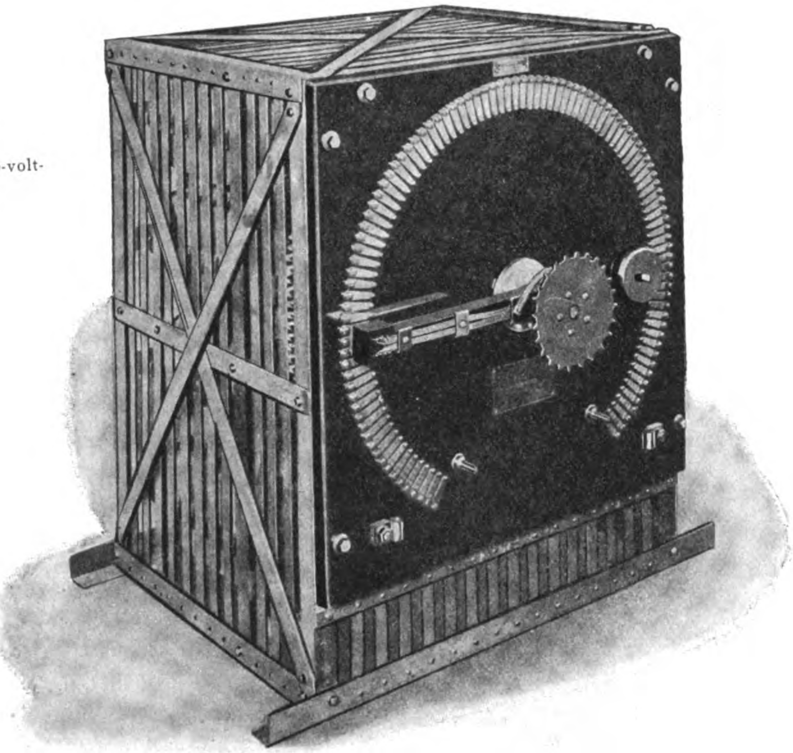


Motor starting rheostat for back of board mounting with no-voltage release; for ¼-50 h.p., 125, 240, and 500 volt, d.c. motors. Made by Industrial Controller Co., Milwaukee, Wis.

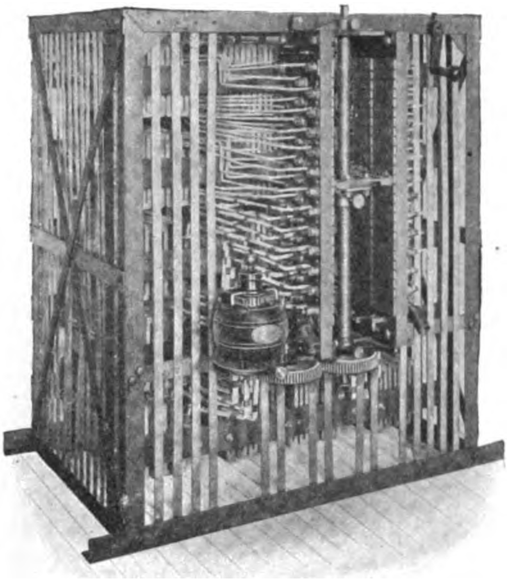
Motor starting rheostat with no-voltage and overload release, for ⅛-50 h.p., 125, 240, and 500 volt, d.c. motors. Made by Industrial Controller Co., Milwaukee, Wis.



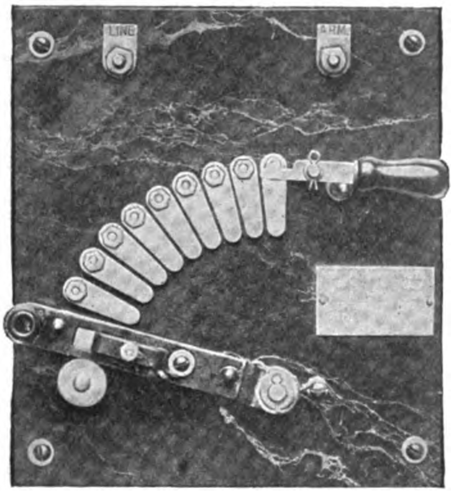
7½ h.p., 220 volt, a.c. motor starting switch; for two and three phase, 25 to 60 cycle circuits. Made by Allen-Bradley Co., 495-497 Clinton street, Milwaukee, Wis.



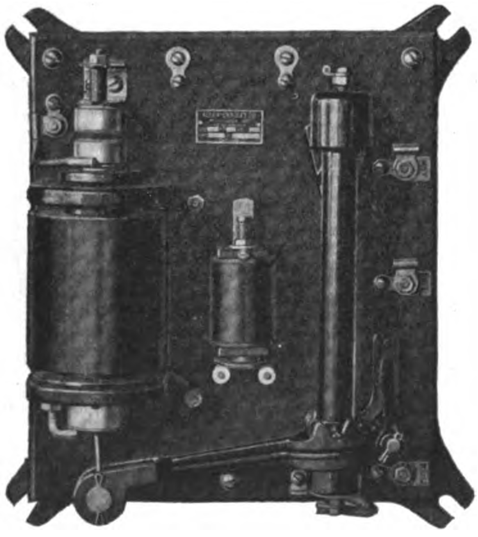
Grid type, back of board field rheostat arranged for chain drive, for from 100-125 volts, to 625-750 volts: resistance varies from equal to field to 4 times resistance of field. Made by The Cutler-Hammer Mfg. Co., Milwaukee, Wis.



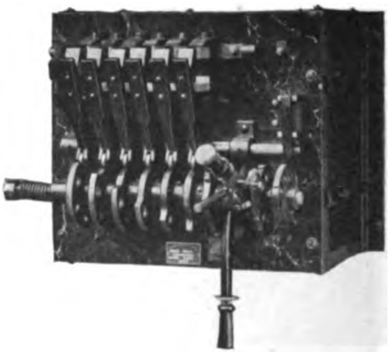
Grid type, motor driven, field rheostat for d.c. or a.c. circuits. Made by The Cutler-Hammer Mfg. Co., Milwaukee, Wis.



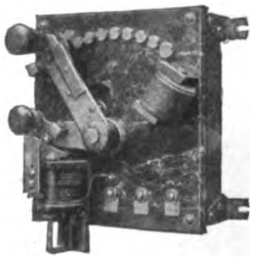
Single phase starting rheostat for 25 to 133 cycle; 110 or 220 volt, commutator type motors from 1-35 horsepower; with hand release. Made by Industrial Controller Co., Milwaukee, Wis.



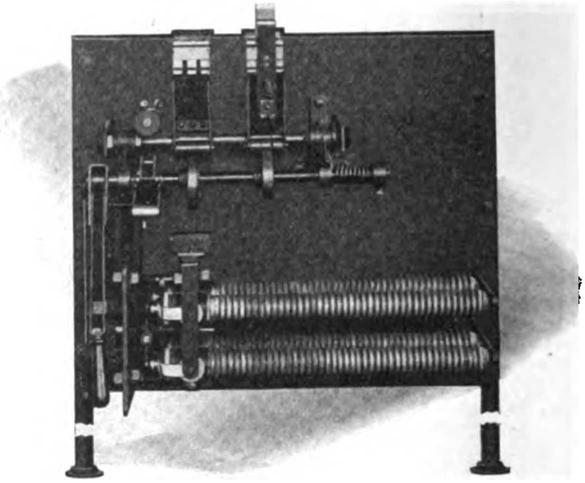
10 h.p., 220 volt, automatic motor starter, for starting shunt, series, or compound wound, d.c. motors in place of a hand-operated starter. Made by Allen-Bradley Co., 495-497 Clinton street, Milwaukee, Wis.



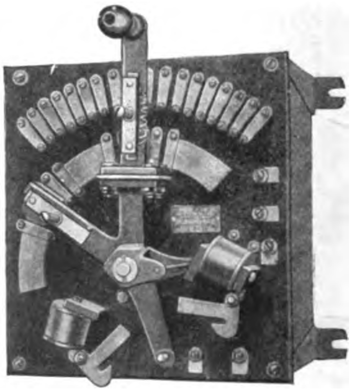
Multiple switch motor starter with no-voltage release; for 10-150 h.p., 110, 220, and 500 volt, d.c. motors; particularly adapted for starting large motors or where starting conditions are very severe. Made by Industrial Controller Co., Milwaukee, Wis.



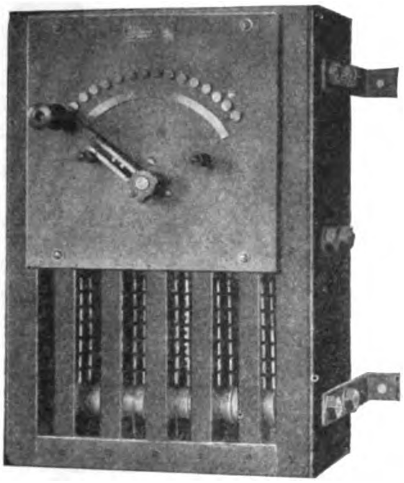
Moisture-proof starter with no-voltage and overload release, for ¼-5 h.p., 115, 230, and 500 volt, d.c. motors. Made by The Cutler-Hammer Mfg. Co., Milwaukee, Wis.



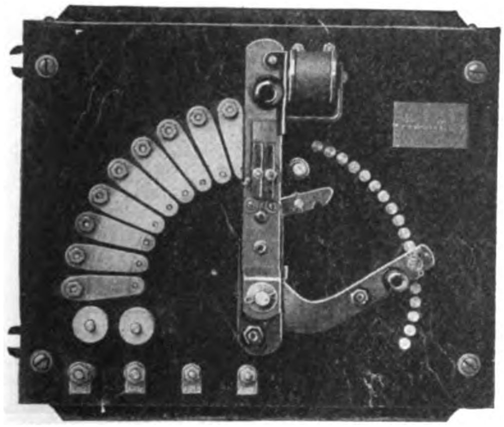
Graphite compression type, hand-operated starting rheostat for 200 h.p., 220 volt, d.c. motors; resists action of moisture and corrosive fumes. Made by Allen-Bradley Co., 495-497 Clinton street, Milwaukee, Wis.



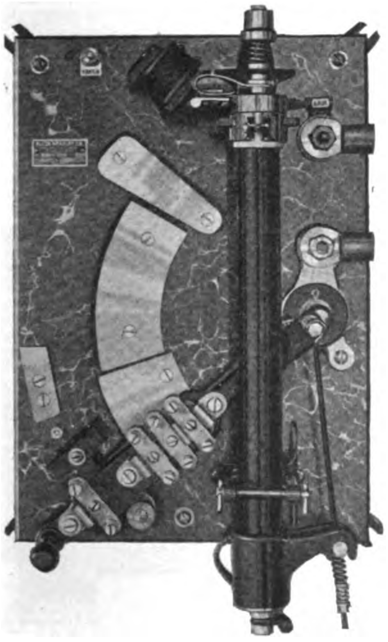
Reversible motor starter with no-voltage release, to start and operate 115, 230, and 500 volt, d.c. motors at full speed in either direction of rotation. Made by the Cutler-Hammer Mfg. Co., Milwaukee, Wis.



Battery charging rheostat for front of board mounting; primarily for use in private charging stations. Made by The Cutler-Hammer Mfg. Co., Milwaukee, Wis.



Compound starting and regulating rheostat with no-voltage release; for printing presses, machine tools, etc.; armature resistance for starting, speed variation by field resistance; for ⅛-50 h.p., 110, 220, and 500 volt, d.c. motors. Made by Industrial Controller Co., Milwaukee, Wis.



40-50 h.p., 220 volt direct current motor starting rheostat with no-voltage release. Made by Allen-Bradley Co., 495-497 Clinton street, Milwaukee, Wis.

In the first paragraph of the previous installment of this article it was stated that "any device by means of which a variable or adjustable resistance may be introduced in a circuit to regulate the strength of the current is a rheostat. All devices, however, that are rheostatic in principle; that is, that change the strength of a current by means of a resistance, are not called rheostats." In the previous installment those devices catalogued and listed by the makers as rheostats were described and illustrated. In this installment those essentially rheostats (with the exception of elevator controllers), but designated by other names are described and illustrated. These devices are: speed regulators, speed controllers, and drum controllers. Elevator controllers, theatre dimmers, and a number of different rheostat accessories will be described and illustrated in a third installment of the article.

SPEED REGULATORS

Regulation in speed of a motor is accomplished by inserting a resistance in the armature circuit or inserting resistance in the shunt field or by the combined use of armature and shunt field resistance. The first method reduces the speed of the motor below normal. The second method increases the speed above normal. By the third method the speed of a motor may be reduced below normal and increased above normal.

All speed regulators are designed and intended to effect speed regulation of motors by one or other of the above methods.

Speed regulators having armature resistance only are intended to reduce the speed of motors from normal to about 50 per cent. below normal when the total resistance is in the circuit and the motor is using its normal current. The amount of possible reduction will be less if the motor is underloaded and consequently using less than its normal current. If a motor with a regulator of the armature resistance type is running at reduced speed by reason of the resistance in its armature circuit, and the motor is underloaded, the speed will be faster than the predetermined reduction. If the motor is overloaded the speed will be slower. Any change in the load will cause a corresponding change in the speed of the motor.

Speed regulators having shunt field resistance only are intended to increase the speed of a motor above normal by weakening the shunt field through the introduction of resistance in the field circuit. The range of speed regulation by this method is, however, limited in motors of standard design and under ordinary conditions, to not more than 10 to 15 per cent. above normal. With this method of regulation the speed of the motor remains practically the same under different conditions of load. Most of the current taken from the line is used in power, the change in speed resulting from the weakening of the counter e.m.f. through reduction of the field strength. Regulators of this type also combine a starter for bringing the motor up to speed and a regulator for controlling the speed, termed compound starting and regulating rheostats.

The widest range of speed regulation in a standard type of motor is obtained by the use of combined armature and field resistance. With regulators of this type the speed of a standard motor may be reduced 50 per cent. below normal by armature resistance, and increased from 15 to 25 per cent. above normal by shunt field resistance.

For the speed regulation of large motors or where the conditions of service are extremely severe the multiple switch type of regulator is used. This type consists of a number of laminated brush and copper contact switches mounted on a heavy panel. These switches are operated by cams on a horizontal shaft which is revolved by means of a lever attached to one end of the shaft. The switches are successively closed by the operation of this lever. This type of regulator is used for speed reduction up to 50 per cent. below normal.

Speed regulators are usually classed as being for fan or machine duty, and are provided with and without no-voltage release, overload release and in some cases with underload release, for 110, 220, and 500-volt direct current circuits. Some types are called reversing speed controllers These are principally for printing presses and similar work for giving a number of forward speeds and usually two reverse speeds, permitting the press or other apparatus to be run backward at a slow speed.

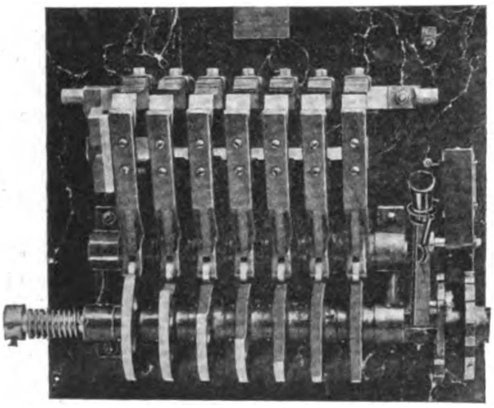
The different types of speed regulators may best be described by pictures with captions. These follow, the caption in each case telling what type of regulator shown, what it is used for, and who makes it.

SPEED CONTROLLERS

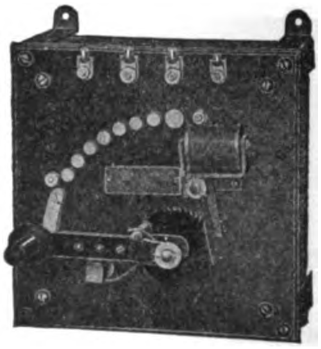
In many cases there is a similarity between speed regulators and speed controllers; both control the speed of direct current motors, and in some cases a device called a controller by one manufacturer is designated as a speed regulator by another maker. More properly, however, by speed controller is meant a controller for direct current crane and hoist motors. These are generally designated as crane and hoist controllers. Illustrations of the various types of both speed controllers more in the nature of speed regulators, and those designated as crane and hoist controllers, are shown, the caption in each case giving the catalogue name of the device shown, what used for, and who makes it.

DRUM CONTROLLERS

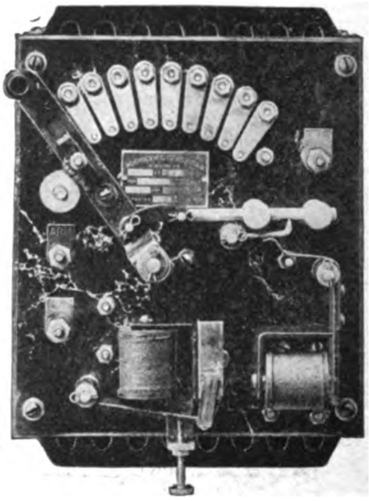
The term drum controller is applied to a class of speed controller comprising a drum actuated by a handle, which throws a resistance into circuit gradually. This resistance is either mounted separately or is self-contained in the controller case. These controllers are reversing and non-reversing; that is, they regulate the speed of a motor in either direction of rotation or only in one direction. Armature resistance is used for starting duty only. Speed regulation is accomplished by shunt field resistance. Illustrations of the various types and makes of drum controllers on the market are shown, the caption under each cut telling what particular type is shown, what used for, and who makes it.



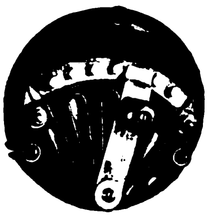
Multiple switch speed regulator with no-voltage release; for fan duty; 50 per cent. speed reduction; particularly adapted for operating large ventilating and heating fans; for 5-200 h.p., 110, 230, and 500 volt, d.c. motors. Made by Industrial Controller Co., Milwaukee, Wis.



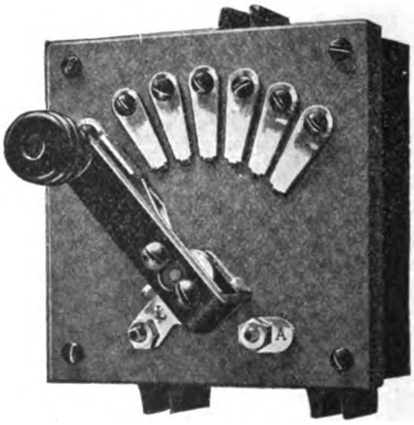
Speed regulator for machine service to reduce motor speed 50 per cent. from normal at full load, by inserting resistance in the armature field for either shunt, series, or compound, d.c. motors. Made by General Electric Co., Schenectady, N. Y.



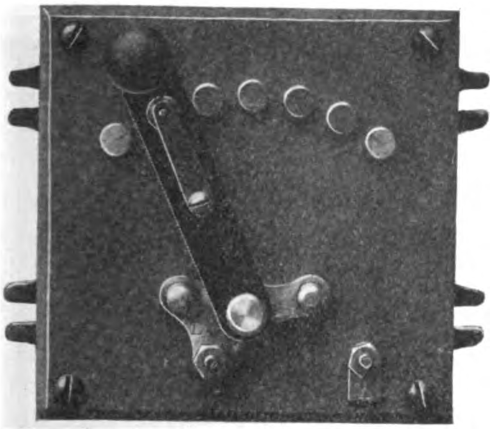
Motor speed regulator, with no voltage and overload release; for fan duty; speed reduction up to 50 per cent; for ¼-50 h.p., 120, 220 and 500 volt, d.c. motors. Made by Industrial Controller Co., Milwaukee, Wis.



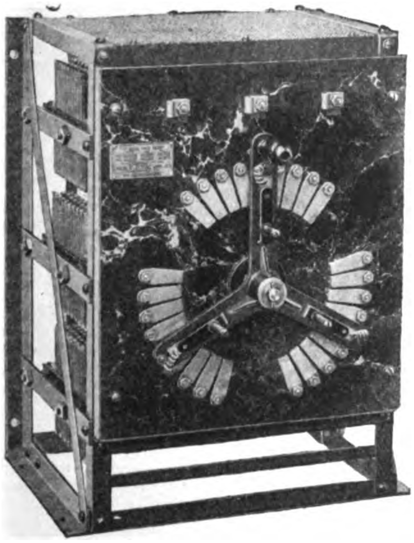
Six-inch, circular plate, speed regulator for 115 and 230 volt d.c. motors not exceeding 1/6 horsepower; may also be used as a field rheostat, dimmer for lighting circuit, regulator for heating coils, and so on. Made by The Cutler-Hammer Mfg. Co., Milwaukee, Wis.



Small motor speed regulator for varying the speed of 1-20 h.p., 110 and 220 volt motors driving fans, blowers, jewelers' and dentists' lathes, revolving signs and sewing machines. Can also be used as a field regulator or heater regulator. Made by Union Electric Mfg. Co., 499 Broadway, Milwaukee, Wis.

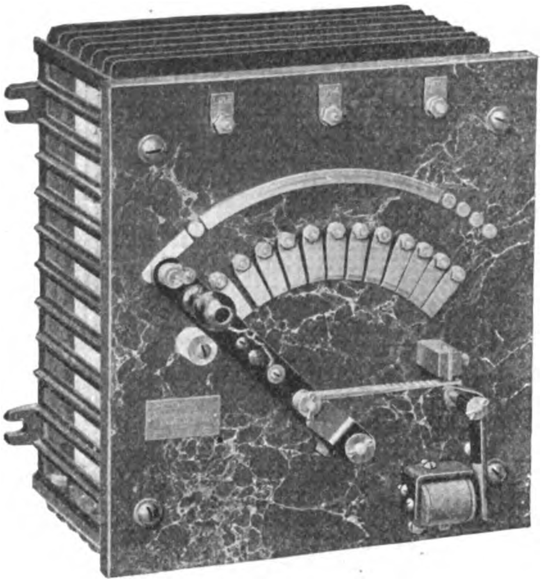


Midget speed regulator, for the speed regulation for small motors used to drive jewelers' and druggists' lathes and drills, washing machines, and sewing machines; six running contacts and one off contact. Made by Industrial Controller Co., Milwaukee, Wis.

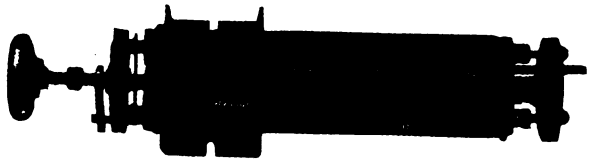


Secondary resistance speed regulator for slip ring type, alternating current, induction motors of from ¼-7½ h.p., driving fans, blowers, machine tools, and pumps. A speed reduction of 50 per cent. under full load can be obtained with this regulator. Made by Union Electric Mfg. Co., 499 Broadway, Milwaukee, Wis.

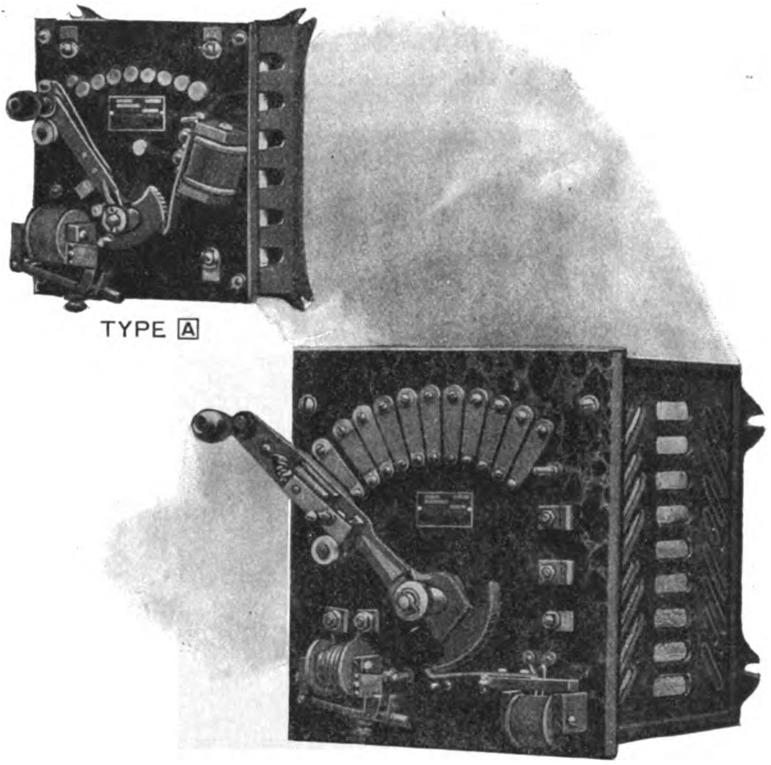
Compound speed regulator for fan duty, with no-voltage and overload release; speed reduction 50 per cent.; increase above normal, 25 per cent.; for ¼-50 h.p., 110, 220, and 500 volt, d.c. motors. Made by Industrial Controller Co., Milwaukee, Wis.



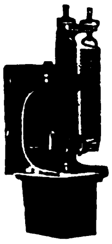
Compound speed regulator with no-voltage release, for reducing the speed of ¼-40 h.p., 110, 220, and 500 volt motors 50 per cent. below normal by means of resistance inserted in series with the armature, and to increase the speed 25 per cent. above normal by means of resistance added to the shunt field circuits. Made by Union Electric Mfg. Co., 499 Broadway, Milwaukee, Wis.



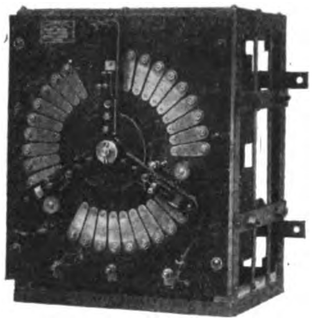
Secondary resistance speed regulator for ¼-10 h.p., two and three phase, slip ring, a.c. motors, driving fans, printing presses and like machinery; speed reduction 50 per cent. by resistance in secondary circuit. Made by Allen-Bradley Co., 495-497 Clinton street, Milwaukee, Wis.



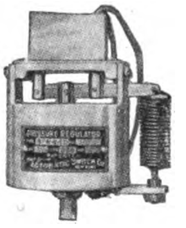
Speed regulators with no-voltage and overload release, to reduce the speed of ¼-50 h.p., 115, 230, and 500 volt, d.c. motors to 50 per cent. below normal by inserting resistance in the armature circuit. Made by The Cutler-Hammer Mfg. Co., Milwaukee, Wis.



Pressure regulating switch for pressure control on small air compressors or hydraulic pumps; may be set for any variation desired within adjustment, to permit of varying the maximum and minimum pressures to suit conditions; for use on small a.c. or d.c. motors without other starting mechanism. Made by Automatic Switch Co., 4 and 6 White street, New York.

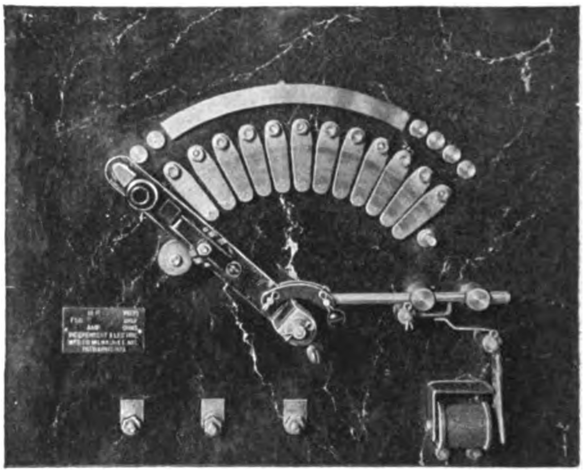


Secondary resistance speed regulator for slip ring, a.c. motors; 50 per cent. speed reduction. Made by Industrial Controller Co., Milwaukee, Wis.

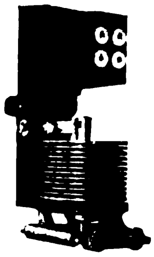


Pressure regulating switch for the automatic control of pumps or air compressors where pressures do not exceed 75 lb. and where the variation in pressures is about one-third maximum pressures; for use on d.c. or single phase a.c. motors up to 1½ h.p., 110 or 220 volts. Made by Automatic Switch Co., 4 and 6 White street, New York.

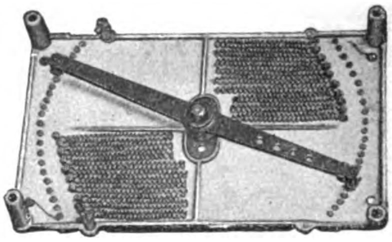
Plain compound speed regulator for fan or machine duty; 50 per cent. speed reduction by armature resistance, 25 per cent. increase above normal speed by shunt field resistance; for ⅛-50 h.p., 110, 220, and 500 volt, d.c. motors. Made by Industrial Controller Co., Milwaukee, Wis.



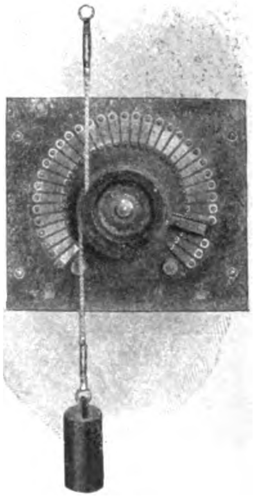
Compound speed regulator with wide range of control—100 per cent. variation by field control, and 50 per cent. by armature resistance; for ¼-50 h.p., 115, 230, and 500 volt, d.c. motors. Made by Industrial Controller Co., Milwaukee, Wis.



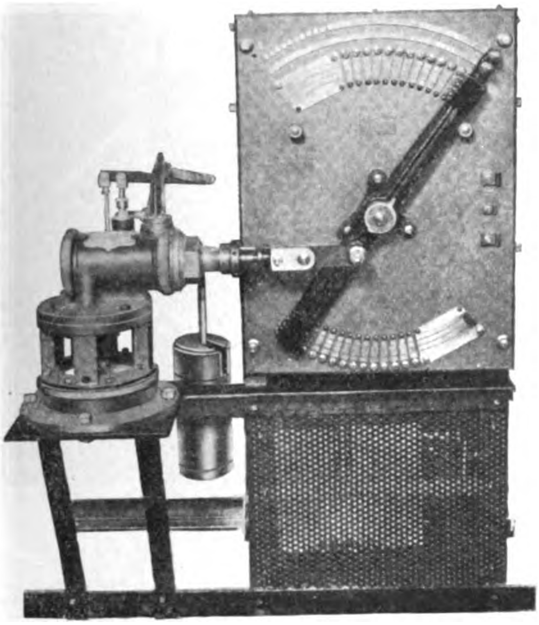
Vacuum regulating switch for automatic control of vacuum return systems, and vacuum cleaner systems, to maintain a constant vacuum within definite ranges; for use on small d.c. or a.c. motors without other starting mechanism. Made by Automatic Switch Co., 4 and 6 White street, New York.



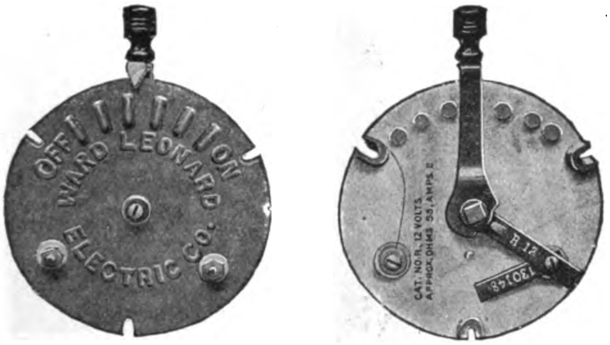
Organ regulator for regulating the speed of ½-5 h.p., 125, 250, and 500 volt motors from full stop to full speed when operating the bellows of a pipe organ. A no-voltage release type motor starter should be used in connection with the regulator. Made by Ward Leonard Electric Co., Bronxville, N. Y.



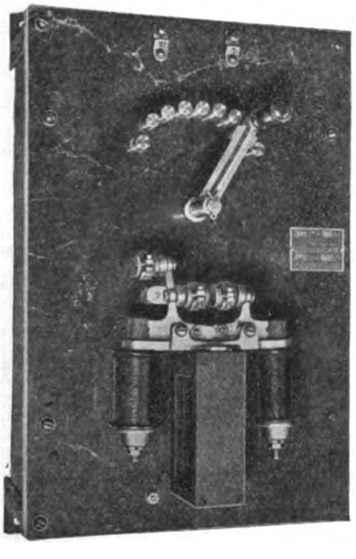
Organ blower speed regulator for regulating the speed of ¼-3 h.p., 115, 230, and 500 volt, d.c. motors from rest to full speed when used in operating bellows of a pipe organ. It is necessary to install a separate starting rheostat. Made by The Cutler-Hammer Co., Milwaukee, Wis.



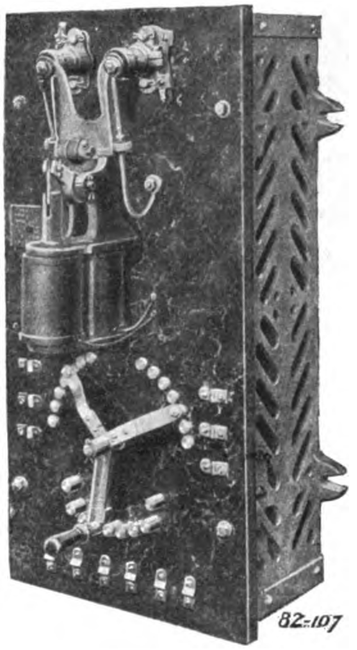
Pressure controlled speed regulator for use with boiler draft fans, boiler feed pumps, gas pressure systems, and hydraulic elevators operated by d.c. motors; automatically regulates speed of motor to maintain operating pressure practically constant. Made by The Cutler-Hammer Mfg. Co., Milwaukee, Wis.



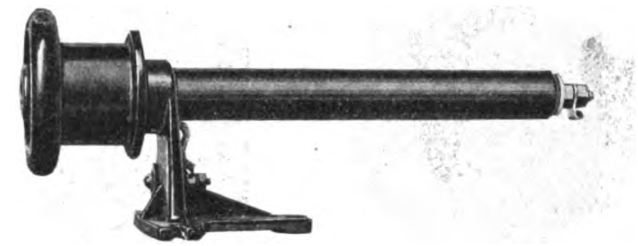
Front and rear view of small motor speed controller for motors up to ⅛ h.p., operating ceiling fans, vibrators and other small apparatus. Made by Ward Leonard Electric Co., Bronxville, N. Y.



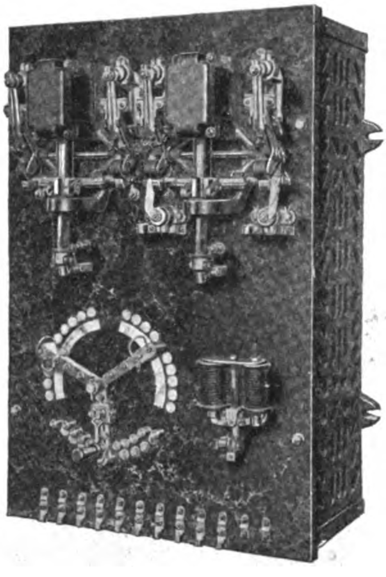
Controller for starting and regulating the speed of ½-15 h.p. motors operating job printing presses and machine tools requiring adjustable speed; gives armature regulation not exceeding 50 per cent. reduction at full load and field regulation not exceeding two to one; speed may be adjusted before the motor is started or during the time the motor is running. Made by Monitor Controller Co., 111 South Gay street, Baltimore, Md.



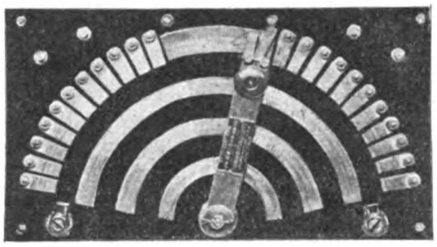
Variable speed alternating current controller for use with two or three phase, slip ring motors up to 7½ h.p., driving printing presses or other machinery where a moderate amount of speed regulation, not exceeding 40 per cent. reduction is desired. The speed regulating handle is pre-set at a point corresponding with the speed at which it is desired to operate the machine. Made by Monitor Controller Co., 171 South Gay street, Baltimore, Md.



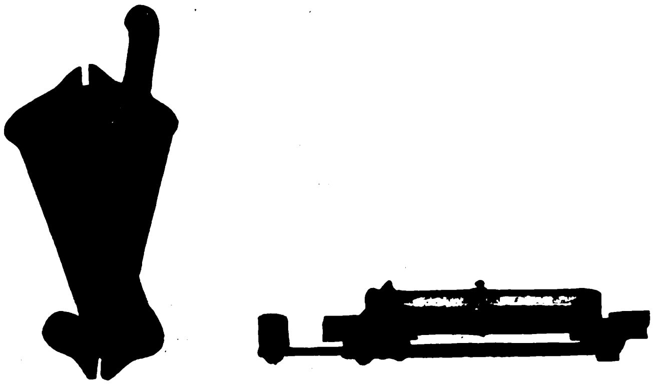
Graphite compression type controlling rheostat, capacity 200 watts; used for a great variety of purposes, such as speed regulator, field rheostat, laboratory rheostat, battery charger, meter testing and so on. Made by Allen-Bradley Co., 495-497 Clinton street, Milwaukee, Wis.



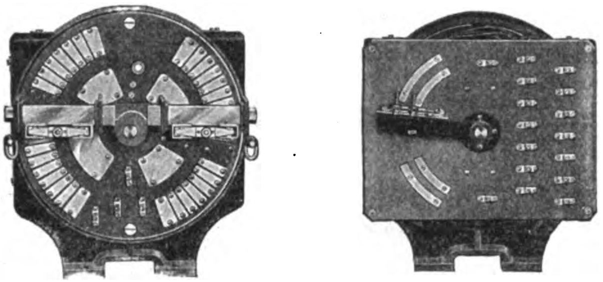
Variable speed, alternating current controller for use with two and three phase motors from 5 to 15 h.p., operating printing presses and other machinery, requiring a wide range of speed adjustment and at the same time requiring full starting torque regardless of pre-set running speed. Made by Monitor Controller Co., 111 South Gay street, Baltimore, Md.



Full reverse armature controller for use in operating 1-10 h.p., 125, 250, and 500 volt motors in either direction of rotation, at any speed between full speed and one-half full speed, under full load conditions. Made by Ward Leonard Electric Co., Bronxville, N. Y.

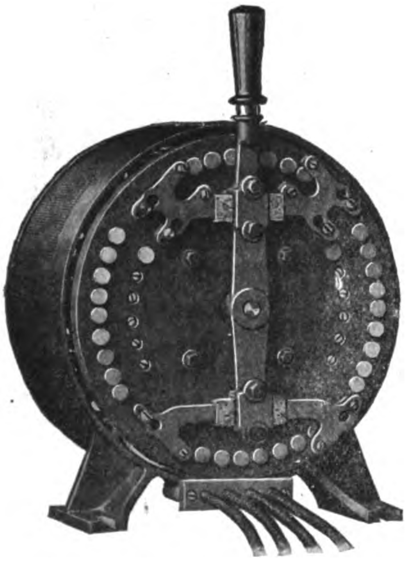


Desk fan controller for mounting in the base of 8, 12, and 16 inch, 125, 250, and 500 volt desk fans. Made by Ward Leonard Electric Co., Bronxville, N. Y.

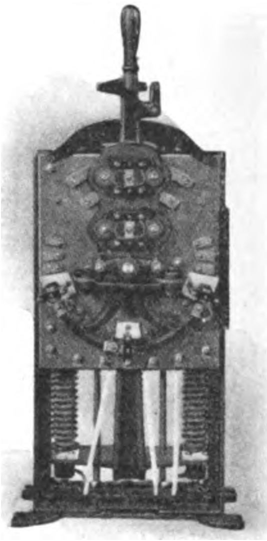


Front View. Rear View.

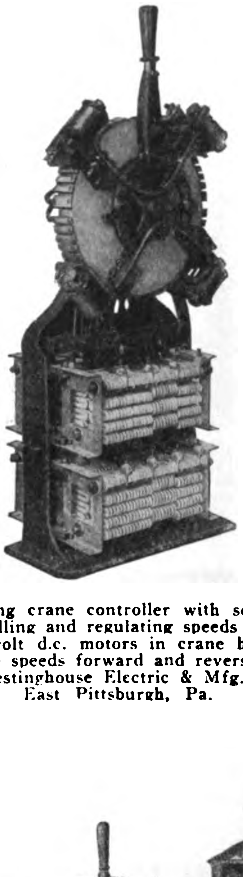
Spring return type of controller with self-contained cast grid resistance, for direct current motors for crane and similar reversing service. For motors of from 1-7½ h.p., 110 volts, and 2½-15 h.p., 220 volts. Made by The Electric Controller & Mfg. Co., 79th street and Woodland avenue, S. E., Cleveland, Ohio.



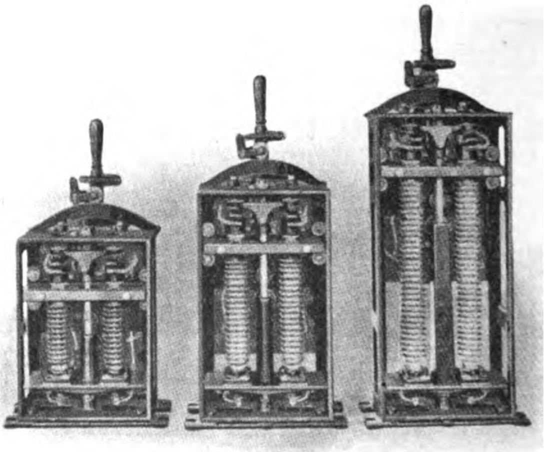
Hand-operated crane and hoist controller for 3-7½ h.p., 115, 230, and 550 volt, d.c. motors operating cranes and hoists; 12 steps forward and reverse. Also made in rope operated types. Made by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



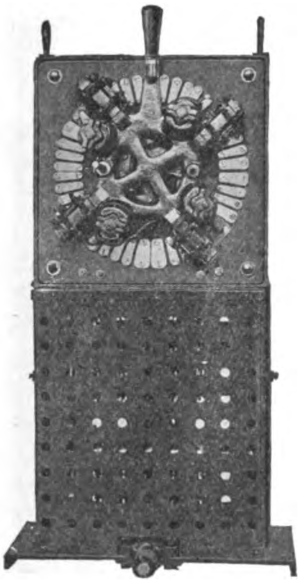
Mill and crane controller for 16-25 h.p., 220 and 440 volt, a.c. motors, operated by lever at top. Made by Allen-Bradley Co., 495-497 Clinton street, Milwaukee, Wis.



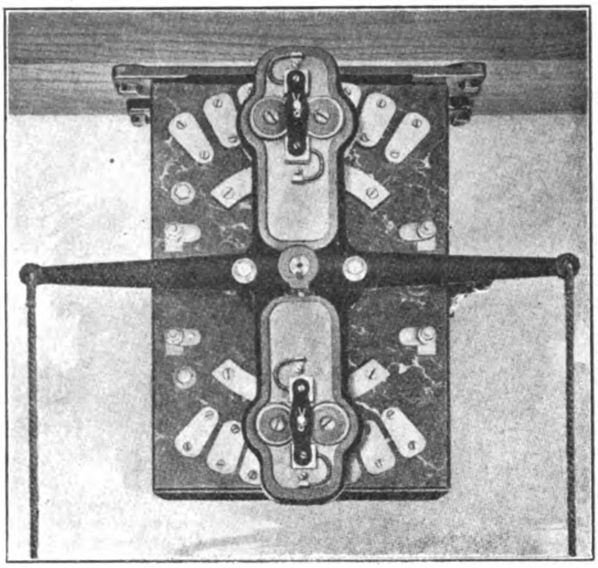
Regulating and reversing crane controller with self-contained grid type resistors for controlling and regulating speeds of 10-75 h.p., 115, 230, and 550 volt d.c. motors in crane hoist, and mill service; 20 speeds forward and reverse. Made by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



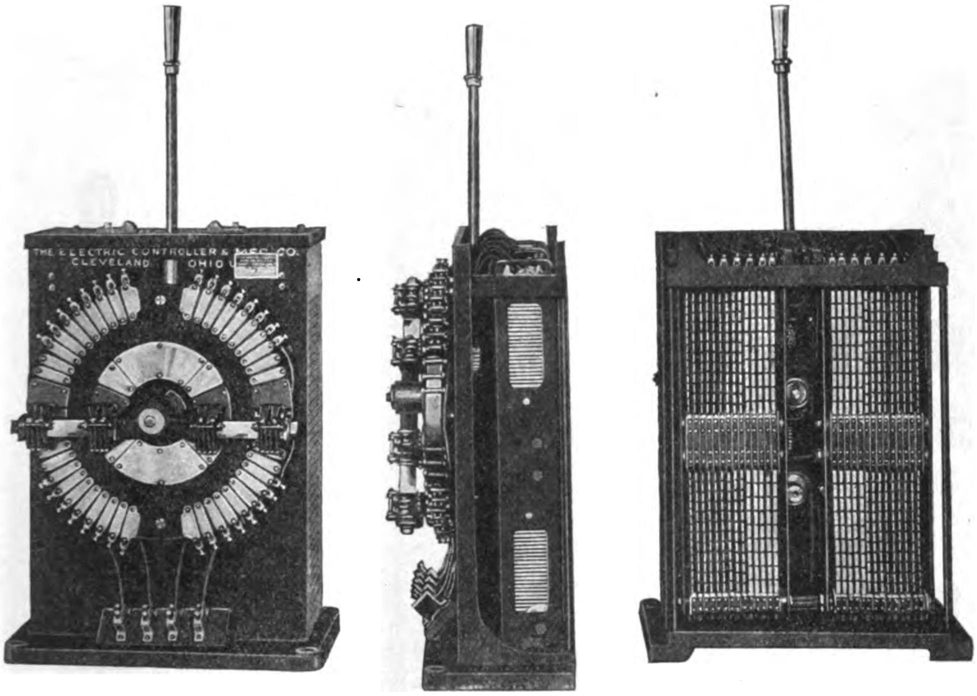
Three sizes of mill and crane controllers for 120 h.p., 110, 220, and 500 volt, d.c. motors; operated by lever at top. Made by Allen-Bradley Co., 495-497 Clinton Street, Milwaukee, Wis.



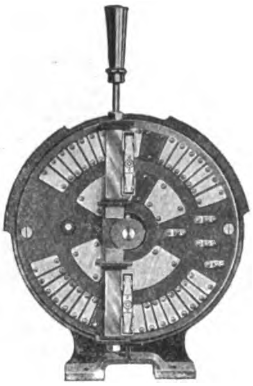
Crane controller with self-contained resistors and blowout coils, for controlling the operation of 5-50 h.p., 115, 230, and 550 volt, series and compound wound, d.c. motors in crane, hoist, and mill service; 12 steps forward and reverse. Made by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



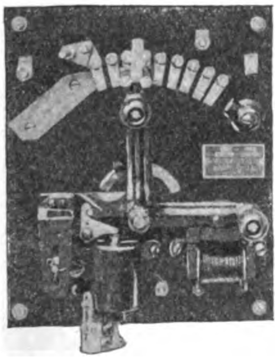
Rope operated mill and crane controller, for 1-7 h.p., 110 and 220 volt, d.c. motors. Made by Allen-Bradley Co., 495-497 Clinton street, Milwaukee, Wis.



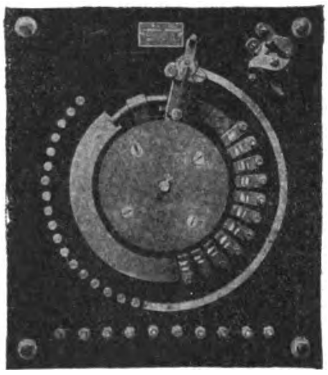
Manually operated, Dinkey, ventilated controller with self-contained cast grid resistance, for controlling 110, 220, and 550 volt, direct current motors under severe and exacting conditions. Made by The Electric Controller & Mfg. Co., 79th street and Woodland avenue, S. E., Cleveland, Ohio.



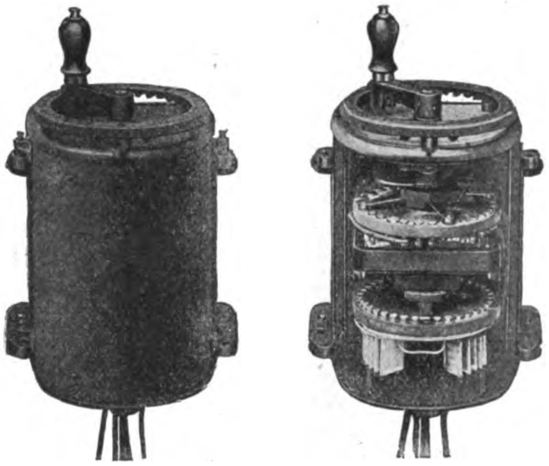
Top lever control type of controller with separate resistance, for direct current motors for crane and similar reversing service where conditions are not sufficiently exacting as to require the use of a Dinkey controller. For motors of from 1-12½ h.p., 110 volt, and 1-25 h.p., 220 volt. Made by Electric Controller & Mfg. Co., 79th street and Woodland avenue, S. E., Cleveland, Ohio.



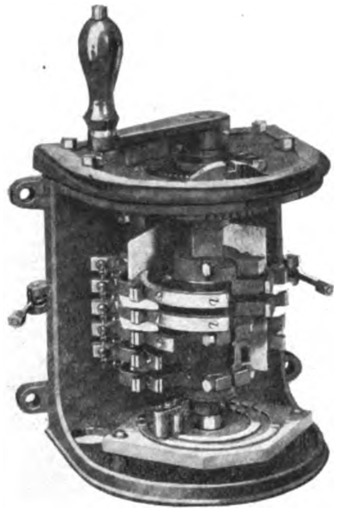
Armature speed controller with no-voltage release and overload circuit breaker, for use in operating ½-50 h.p., 125, 250, and 500 volt motors continuously at any speed between full speed and one-half full speed under full load conditions. Made by Ward Leonard Electric Co., Bronxville, N. Y.



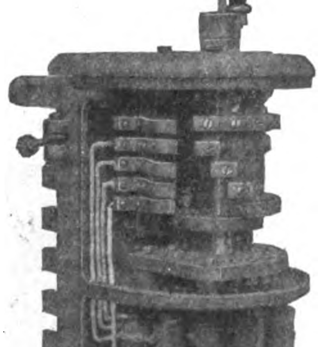
Non-reversible, combined armature and field controller for motors of from ⅛-15 h.p., 125, 250, and 500 volts. Made by Ward Leonard Electric Co., Bronxville, N. Y.



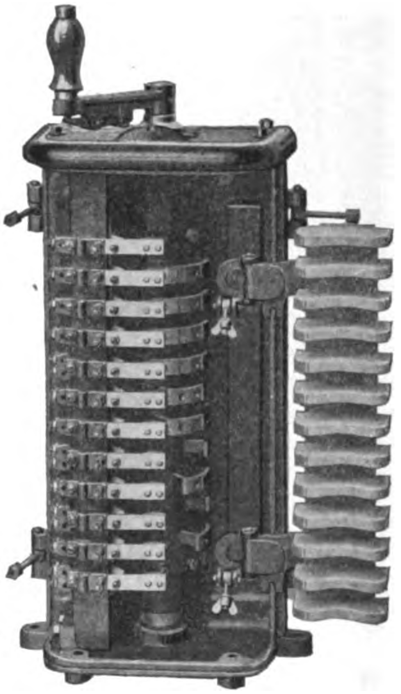
Machine tool controller for use in connection with 1-50 h.p., 110 to 550 volt, shunt and compound wound, d.c. motors in machine tool and other reversing services requiring speed adjustment by field control; motor started in either direction of rotation and brought up to desired running speed. Made by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



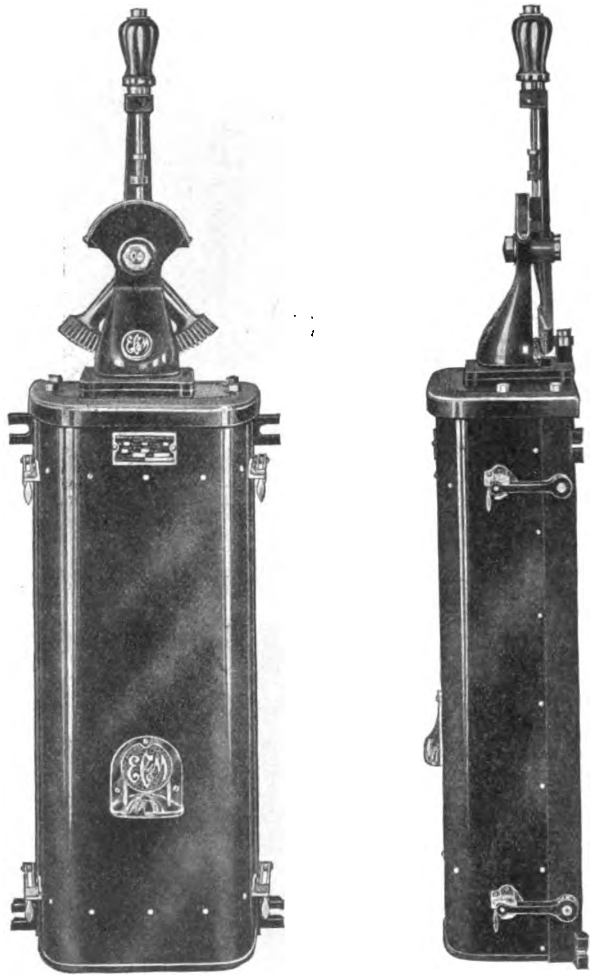
Reversible compound drum controller for use with 1-50 h.p., 110, 220, and 500 volt, d.c. motors requiring a wide range of speed. Speed regulation obtained by combined armature and shunt field resistance. Made by Union Electric Mfg. Co., 499 Broadway, Milwaukee, Wis.



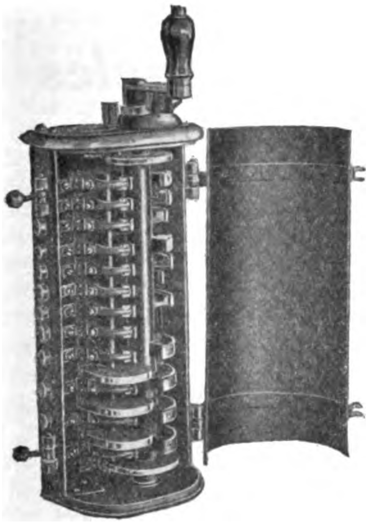
Drum controller with two reverse speeds, for printing press service; speed reduction 50 per cent., by armature resistance; for 1-50 h.p., 110, 220, and 500 volt, d.c. motors. Made by Industrial Controller Co., Milwaukee, Wis.



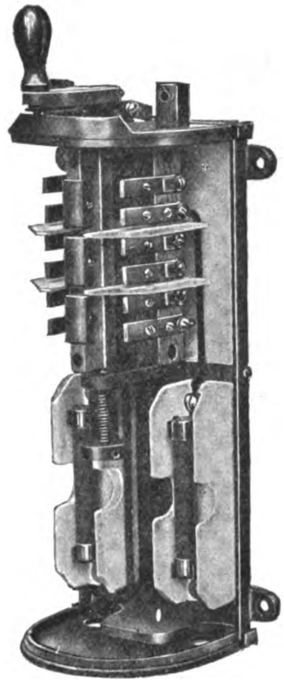
Weatherproof, reversible, drum type controller for use with 1-60 h.p., 110, 220, and 500 volt d.c. series motor operating cranes, hoists, and similar machinery. Speed regulation obtained by means of resistance in series with the armature; for use with series brakes. Made by Union Electric Mfg. Co., 499 Broadway, Milwaukee, Wis.



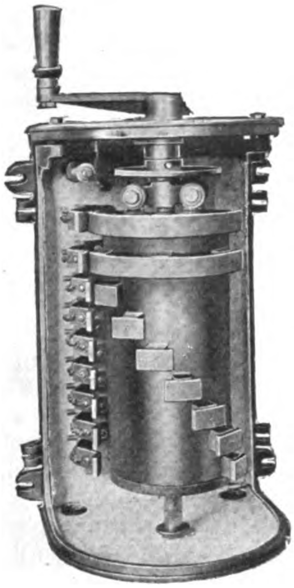
Front and side views of drum controller equipped with vertical operating lever; for the regulation of reversing direct current motors of from 1-100 h.p., 110, 220, and 550 volts. Made by The Electric Controller & Mfg. Co., 79th street and Woodland avenue, S. E., Cleveland, Ohio.



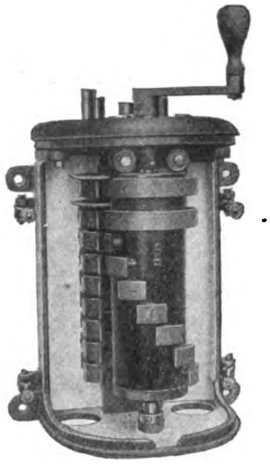
Drum controller for industrial service for the control of three phase, slip ring, a.c. motors used in operating machine tools, cranes, hoists, and similar apparatus where frequent service is required; reversing and non-reversing; 8 speeds forward and reverse. Made by General Electric Co., Schenectady, N. Y.



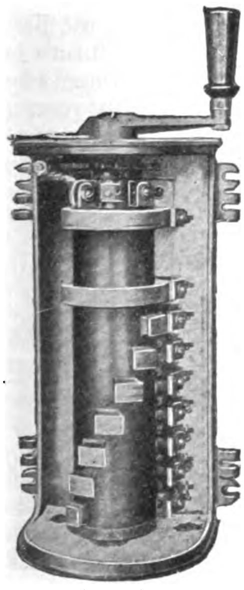
Drum type starter for 100, 220, 440, and 660 volt, two and three phase, squirrel cage, alternating current, induction motors of from ¼-7½ horsepower. Made by Union Electric Mfg. Co., 499 Broadway, Milwaukee, Wis.



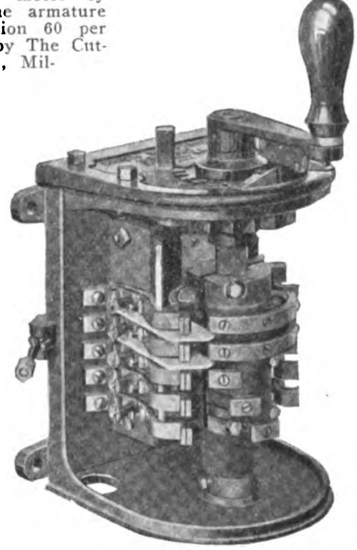
Non-reversible, drum type controller, for machine duty; speed reduction 50 per cent.; for 1-50 h.p., 110, 220, and 500 volt, d.c. motors requiring frequent starting and stopping. Made by Industrial Controller Co., Milwaukee, Wis.



Non-reversible drum controller for use with 1-50 h.p., 115, 230, and 500 volt, d.c. motors driving flat bed printing presses and similar machinery requiring frequent starting and stopping; arranged to vary speed of motor by means of resistance in the armature circuit only; speed reduction 60 per cent. at full load. Made by The Cutler-Hammer Mfg. Co., Milwaukee, Wis.



Drum controller with two reverse speeds, for printing press service; speed reduction 50 per cent., by armature resistance; for 1-50 h.p., 110, 220, and 500 volt, d.c. motors. Made by Industrial Controller Co., Milwaukee, Wis.



Drum controller for controlling the speed of direct current motors operating presses, machine tools, and similar service requiring frequent starting and stopping and changes in speed. Made by Union Electric Mfg. Co., 499 Broadway, Milwaukee, Wis.

Report on Plugs and Receptacles

The chairman of the committee on plugs and receptacles of the National Electric Light Association has submitted a provisional report to the association covering this important subject. The report as adopted will be presented at the June meeting of the association. Meantime, however, it is subject to possible change. In the letter accompanying the report made to the association the chairman, R. S. Hale, says that since the provisional report was adopted some of the manufacturers have conferred with a view to making their plugs and receptables interconnectable. He adds that some of the manufacturers whose plugs and receptacles have certain weaknesses are making plans to drop the manufacture of them, and to adopt one of the other types—all of which will lead ultimately to the standardizing of a single type. The provisional report as submitted is substantially as follows:

The committee was, two years ago, assigned the task of standardizing plugs and receptacles, so that the purchaser of a small flat-iron or other device with a cord and attachment plug* suitable for use on lighting circuits, would find that his purchase could be used on the receptacles already installed in his house as well as on his lamp sockets.

At first the committee made no progress. This was largely on account of patent difficulties, but in addition to these it was found that in some cities underwriters and other inspectors were forbidding the use of receptacles on lighting circuits, and requiring receptacles to be installed on separate circuits. The result was that when a user of a heating device desired to install a receptacle rather than use a heating device from a lamp socket, he found himself deterred by the prohibitive cost involved if his wireman obeyed the interpretation of the rules, and instead of installing a receptacle he continues to use the heating device from the lamp socket.

In its past reports the committee made some recommendations which, if adopted by the underwriters, would have obviated this difficulty, but they refused to take any action, and the committee now recommends the following action on the part of the N. E. L. A.:

PLUGS AND RECEPTACLES FOR LIGHTING CIRCUITS ALONE CONSIDERED

For the moment we should confine ourselves to the class of small plugs and receptacles suitable for use on lighting circuits.

The line of demarcation at present is 660 watts, or 6 amperes at 110 volts.

Plugs and receptacles of larger capacities are chiefly for charging storage batteries, and are being standardized by other committees. In any case they are not considered in this report except as noted.

ARTICLES ON LIST

The committee has prepared the following list of the small plugs and receptacles. Some of these have in the past been rated as good for higher wattages than would be allowed on lighting circuits, but it is understood that the manufacturers of the articles here listed have agreed to use all reasonable effort to keep their plugs off of any devices taking more current than is allowed on lighting circuits, even if such plugs and receptacles are actually safe with a higher current than the highest permissible load on a lighting circuit. In other words, all the plugs and receptacles in this list will hereafter be nominally rated as good only for 660 watts or less, and as not proper for use on devices that take over 660 watts, so long as this remains the capacity allowed on lighting circuits.

In this report the various types are referred to by the manufacturers' names, on the understanding that this describes them sufficiently for all practical purposes. The output of a given manufacturer may, for instance, include wall receptacles, floor receptacles, separable plugs and receptacles, angle receptacles, etc. They will all be considered as being in this list so long as the manufacturer does not claim for any plug connecting to such receptacles a capacity greater than the capacity allowed on lighting circuits by the National Electrical Code.

LIST

The ordinary Edison screw-base receptacle is, of course, allowed, and the solid or swivel plug for use in such receptacles or in a lamp socket are, of course, allowed whenever a non-separable plug may be used.

The other types are as follows:

Bryant
Chelten
Cutler-Hammer
Diamond H
Federal
General Electric
Hart Mfg. Co.
Hubbell
Paiste
Trumbull

Since the provisional adoption of the report the following has been presented and should for all practical purposes be considered as in the report: National Metal Moulding. This will connect with the Hubbell and, of course, the Hubbell will connect with the National Metal Moulding.

Benjamin has also applied and may possibly connect with one of the others on the list.

POLARITY RECEPTACLES AND PLUGS

None of these are at present included in the list, and unless included in the list these should in future be installed on other than the ordinary lighting circuits. There is good reason, however, why polarity receptacles should be included in this list as approved types, provided the manufacturer of such agrees to attempt to keep them off of any device of higher capacity than is allowed on lighting circuits.

PLUGS AND LARGE DEVICES

It is understood that such plugs (polarity or ordinary) as these firms may make of larger capacity (15 amperes or over), will be made so as not to fit the small-size receptacles.

RE-RATING

Some of the small-size plugs now made by these firms have in the past been given a rating of 10 amperes, but it is understood that ratings of not over 6 amperes at 110 volts (660 watts) will hereafter be advertised for the small-size plugs and receptacles in this list. This will not involve any change in the design or manufacture.

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* In this report "plug" refers to the cap of separable plugs as well as to the whole plug whether separable or non-separable.

FUTURE CHANGE OF RATING

The limit of 6 amperes at 110 volts, or 660 watts, is the present limit allowed by the National Electrical Code on lighting circuits. If the limit allowed by the Code should be changed in future, a similar change would naturally be made in the maximum rating of this class of small plugs and receptacles.

PRACTICE OF MEMBERS

It is recommended that N. E. L. A. members (both company and individual), refuse to purchase for use on lighting circuits any receptacles or plugs that do not connect to any of the plugs and receptacles on this list.

TO MANUFACTURERS

A complete outfit consists of: A, wall or baseboard receptacles; B, plugs that fit in such receptacles (this including the cap of separable plugs) and also C, of connectors that have on one side an Edison screw plug similar to a lamp base for use in lamp sockets, and on the other side the receptacle for the cap, the connector and cap together making a so-called separable plug. If the output of any manufacturer does not constitute one portion of a *complete* outfit, such manufacturer should take note of the fact that his product will be omitted when final standardization is effected, and should make early arrangements accordingly.

FUTURE IMPROVED DEVICES

If any new type of plug and receptacle should be developed or presented to the N. E. L. A. (even if not interchangeable with any of those on the list), the N. E. L. A. should, nevertheless, until further notice, be prepared to add it to the list; but the committee hopes that the progress of the industry and the expiration of patents will lead to the universal adoption of only one type, and that one of the types already in use.

LARGE RECEPTACLES, OR RECEPTACLES FOR LARGE DEVICES NOT SUITABLE FOR USE ON LIGHTING CIRCUITS

The committee recommends that no outlets other than lamp sockets, Edison screw base receptacles, or the receptacles on this list be allowed on lighting circuits, and the committee considers that the underwriters and inspectors will be justified in requiring separate circuits, pilot lights, etc., for receptacles, not on this list.

RESULT IF THE N. E. L. A. ACCEPTS THIS REPORT

The result of acceptance of this report should be a first step towards standardization.

The next step will come when any of the plugs and receptacles on this list cease to be made, and give place to better ones, and the final result will be arrived at when only one is left.

On account of the patent difficulties alone it would be undesirable for the committee now to select any one type from the list, but if the holders of patents will only license other manufacturers on reasonable terms, the final standardization of plugs and receptacles (similar to the present standardization of the screw lamp base and socket), will be sooner arrived at.

As we go to press the chairman of this committee, R. S. Hale, notifies us that the Trumbull Electric Mfg. Co. and the Benjamin Electric Mfg. Co. have arranged to make their receptacle plugs interchangeable, so that the plug portion of either the Trumbull or Benjamin will fit into the body portion of any wall or base receptacle which either company may put out.

Incandescent Lamp Development

Edison chose carbon for his filaments, says C. P. Steinmetz in a recent issue of the *Edison Business Builder*, because of the high temperature that this material would stand. Platinum and other metals were less efficient. Others were tried in the earlier days, but were not a success because the filaments melted down. This was due to impurities in the metals, as chemistry was not then able to produce a metal sufficiently pure to stand the high temperatures demanded. Carbon does not melt but evaporates. Just as water does at ordinary temperatures, carbon will do at high temperatures. Upon evaporation it deposits upon the glass and blackens it.

CARBON FILAMENTS

It was found that different forms of carbon showed different evaporation so that the carbon deposited from gasoline vapor can be run at higher temperatures than the ordinary carbonized filament without too rapid evaporation and blackening. So by treating the filament hot in gasoline vapor, carbon was deposited upon it that permitted higher temperatures and greatly improved the efficiency; and such treated filaments, therefore, have been used for many years.

METALLIZED CARBON

Then by the research laboratory in Schenectady it was found that by heating such treated filaments to enormously high temperatures in a carbon tube furnace, the carbon was changed to another modification—metallic carbon that has the properties of a metal, and this is still more stable and permits still higher temperatures and efficiencies—this is the metallized filament.

METAL FILAMENTS

All metals, even tungsten, melt at a lower temperature than carbon. But the evaporation of carbon, even of the metallic carbon, is much higher at the same high temperature than that of some metals like tungsten, tantalum, and osmium. That is, with these metals, although they melt below carbon, you can go so much nearer to their melting point without getting serious evaporation that you can run them at higher temperatures than the carbon filament and so get higher efficiency.

OSMIUM INSUFFICIENT

Osmium was introduced first and gave 1.5 watts per candle against 2.5 for the metallized carbon. But osmium is such a rare metal that all the osmium ever found on earth would hardly be enough to supply the demand of incandescent lamps for more than a few weeks, so osmium was excluded from general use.

TANTALUM TRIED

Then tantalum was introduced. While tantalum is a rare metal, it is not so rare but that it can be found in almost unlimited quantities; only so scattered and in such percentages that it is most expensive to separate. Tantalum does not stand as high temperatures as osmium but higher than carbon, and the tantalum lamp gave two watts per candle.

TUNGSTEN BETTER

Tungsten is most difficult to get perfectly pure and to handle in form, so it took enormous work and research to get the present tungsten filament. But tungsten stands the highest temperatures, higher than osmium, and tungsten lamps therefore could be run at efficiencies of 1 to 1.25 watts per candle.

WHY VACUUM WAS EMPLOYED

All these lamps were run in a vacuum. With the carbon lamp the reason was that the carbon would burn up in the air and at the high temperatures the filaments would combine even with nitrogen and hydrogen gases. Furthermore, in a vacuum all the electrical energy which is put in a filament is radiated, while with the filament in a gas, a large part of the energy is wasted by heat convection by being carried away by the gas currents; so that it takes so much less power to keep a filament at the same temperature in a vacuum than it takes to keep it in a gas. That is, at the same temperature of the filament the vacuum lamp is much more efficient. Therefore, in all the metal filament lamps, until recently, a vacuum has been used also.

THE USE OF INERT GASES

However, the boiling point of a metal and therefore also the evaporation of a metal at a temperature below the boiling point depends on the gas pressure. The lower the pressure the lower the boiling point. If, instead of in a vacuum you run the filament in a gas you can run it much hotter before you get the same evaporation, that is, the same blackening. Filling the bulb with a neutral gas, therefore, makes it possible to raise the temperature of a filament and so get a higher radiation efficiency. But at the same time you get an increased loss by the heat carried away by the gas currents, and this again lowers the efficiency. With small diameter filaments the loss of efficiency by heat convection is greater than the gain by the higher temperature and gas-filling therefore lowers the efficiency. With large diameter filaments, however, you lose less by heat convection than you gain by running at higher temperature, and therefore in the larger units, especially the high current lamps, the gas-filled tungsten lamp is much more efficient than the vacuum lamp; this has made it possible in the 20-ampere Type C mazda lamps, to come to efficiencies of one-half watt per candle, and still higher efficiencies are within the range of possibilities.

Westinghouse Relief and Service Pensions

The Westinghouse Electric & Mfg. Co. has just issued a preliminary statement of its sickness and accident relief, accident compensation, and service pensions on which its officers have been working for over a year. The privileges of the relief department are open to every employee, male or female, regardless of age, position or location, upon payment of small monthly dues. The company pays the entire expense connected with the operation and maintenance of this department, the dues being reserved wholly for the payment of benefits (proportioned to wages) for sickness and accident arising from causes other than employment. In the event of death the amount paid from the dues will be duplicated by the company which will also meet any deficit that may arise. Benefits will continue as long as disability lasts, or until the age of 70 years is reached, when pensions will then be granted.

The accident compensation fund is maintained entirely by the company for the benefit of all employees, male or female, whether they belong to the relief department or not. This plan covers the payment for disability due to accident, or for death resulting from accident, while at work as an employee, and makes provision for both total and partial disability. In case of total disability the company will pay as long as the disability lasts, even for life, two-thirds of the average wages received, and for partial disability, two-thirds of the reduction in the earning capacity of the employee, even though the employee should eventually leave the service of the company.

Employees of the company shall be retired at the age of 70 years, and those who at the time of such retirement are members of the relief department, and have completed at least 20 years of continuous service, are to be granted a pension amounting to 1 per cent. of the average monthly wages during the last 10 years of employment for every year of continuous service, with a minimum of $20 per month and a maximum of $100 per month. Upon the death of the pensioner, one-half of the pension will be paid to the widow until re-marriage, providing marriage occurred at least 10 years before the granting of the pension. For the support of each child under 16 years of age, and for each wholly dependent grandchild under 16 years of age, one-fourth of the pension will be paid until they reach the age of 16 years.

The president may, at his discretion, retire any employee between the ages of 60 and 70 years who has been in the service the required time, and he may increase any pension for specially meritorious service by 25 per cent., but not beyond the maximum pension of $100 per month.

New York Automobile Show

Over 300,000 people visited the Fifteenth Annual National Automobile Show held in Grand Central Palace, New York, January 2 to 9, 1915, the largest attendance ever registered for an automobile show. There were a total of 336 exhibits; 81 given over to gasoline cars, 6 to electric cars, 13 to motorcycles, and 236 to accessories. The number of cars shown were 528; the lowest price for any one car was $295, the highest price, $7,000. An unusual feature of the show was the setting apart of a large space containing a number of desks so that manufacturers of commercial vehicles could obtain representation by having a salesman at a desk. No commercial vehicles were exhibited.

The usual large number of makes of spark plugs and ignition devices were shown, as well as a number of makes of electric starting and lighting systems, storage batteries, lamps, horns, and signal devices.

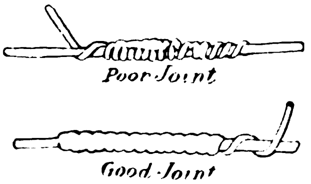
Some of the most interesting electrical accessories exhibited were: starting and lighting systems for Ford cars, shown by Apple Electric Co., Chicago Electric Specialties Co., Gray and Davis, Inc., Kemco Electric Starting and Mfg. Co., and Leece-Neville Co.; an electric brake shown by the Hartford Suspension Co.; rear end signal to prevent collisions, controlled from steering wheel, shown by Nokolyd Signal Co.; electric switch forming part of steering wheel, for operating horn, and three makes of heated grips for steering wheels. The Westinghouse Electric & Mfg. Co., had in connection with their exhibit three charts showing the wiring of automobiles, for magneto system lighting, for single wire or grounded systems, and for two-wire systems, respectively. The charts were working models, switches and miniature lamps being placed in their proper places and connected to storage batteries.

CONTRACTORS' SCRAPBOOK

Writing on business matters in their home town, M. B. Richards & Sons, Front and Buttonwood streets, Reading, Pa., say:

> The electrical end of our business has shown a wonderful increase. We specialize on flashlights, electrical toys, etc. It is interesting to note the desires of the public to do things electrically. It has been a big year for electrical toys such as trains, motors, transformers, flashlights, tree outfits, batteries, etc. It is surprising to learn of boys ranging in age from 10 to 15 years of age, their knowledge and desire to do all sorts of things electrical. We predict that the rising generation will be an electrical one. We know it to be a fact that fond fathers buy these toys more for their own amusement than to please the "kiddies." If Ben Franklin of key and kite fame could only return to earth, the youngsters of today would surely put one over on "Bennie."

Under the caption "Proper Method of Making Wrapped Soldered Joints," the M. W. Dunton Co., of Providence, R. I., reprints the substance of a letter from an electrical contractor, who cites his experience with soldering. Experience has taught me these four things about soldering, says this writer, and these are:



The wrong and the right way of making wrapped soldered joints. From "Soldering Kinks No. 2." Published by The M. W. Dunton Co., Providence, R. I.

1—Coppers must be kept clean and well tinned. This can be done by filing them bright and working in Nokorode and solder when hot.

2—A good flux must be used; *try Nokorode.*

3—The metal must be thoroughly cleaned before the joint is made.

4—The joint must be heated above the melting point of solder.

In electric lighting the energy of the current is converted into heat in the lamps. The resistance of the lamp is made great so that the required quantity of heat may be developed, while in the wire leading to and from the lamp the resistance is made as small as is commercially practicable, so that as little energy as possible may be wasted in heating the wire.

A letter from a repair man received recently asked how he could rewind a 5 h.p. shunt wound motor operating at 1600 revolutions per minute on 240 volts so as to reduce it to a motor with a capacity of not more than 2 h.p. operating at 450 revolutions per minute. He was told that this motor could not be rewound for this rating so as to operate continuously, but that if he wished to set his capacity at 2 h.p., it would operate at 675 revolutions per minute if the armature were rewound with No. 18, B. & S. double cotton covered wire, 9 turns per coil. If he wished to limit its speed to 450 revolutions per minute on continuous operation he should rewind the armature with No. 20 B. & S. double cotton covered wire, 13 turns per coil. With this winding it would develop 1¼ h.p. If he rewound the armature with No. 19 B. & S. double cotton covered wire, 12 turns per coil, the motor would develop 2 h.p. at 450 revolutions per minute, but only for one-half hour service.

Four years ago three carbon lamps were sold for every Edison mazda lamp; today twelve Edison mazda lamps are sold for every carbon lamp. If all the filaments used in the Edison mazda lamps manufactured in 1913 were made into one length they would stretch for fifty million feet or nearly half way around the earth, says the *Edison Business Builder.*

For permanent magnets a steel containing 4 to 5 per cent. of tungsten and 0.5 to 0.7 per cent. of carbon, if heated to a red heat and quenched in water, will retain its magnetism better than ordinary hardened carbon steel.

Last year, one of the large electrical manufacturing companies turned out a turbine-generator set with a maximum capacity of 35,000 kilowatts. The same company also made baby turbine-generators for supplying current for incandescent headlights and cab lights on steam locomotives. The baby unit has a normal rating of 100 watts, 6 volts, at 3600 r. p. m., and a maximum continuous capacity of 140 watts.

A successful electrical contractor in a Wisconsin city of 30,000 has made it a point to include in all cost prices of supplies an allowance of at least 21 per cent. to cover "overhead," before the item of profit is added. This figure of 21 per cent. is applied to all wiring supplies, devices, etc., but even this amount has been found insufficient in the case of reflectors and glassware, where it has been proved necessary to charge at least 25 per cent. on account of breakage and damage incurred in handling.

At the January meeting of the American Institute of Electrical Engineers, I. W. Gross showed a set of formulas that expressed the repulsion force between the conductors of a cable, or between busbars, whenever a short circuit occurs. Interpreting these formulas so that the ordinary person could understand them, the author demonstrated that in the case of a cable the intensity of the repulsion force caused by the magnetic field around the wires often amounted to 2½ tons per foot. In the case of a busbar it amounted to about ½ ton for every support.

CONTRACTORS AND DEALERS NEWS

The Beck Electrical Construction Co., 204 Andrus Building, Minneapolis, Minn., makes the following report on recent electrical contracts: 1. Complete electrical installation in the Prospect Park M. E. Church. The main auditorium and balcony are illuminated by special indirect lighting fixtures, designed and built for this job. 2. Complete electrical installation in the First M. E. Church. The church is lighted by means of the new 300-watt nitrogen lamps. 3. A special installation in the Trinity Baptist Church. 4. Installing 225 additional h.p. and lighting for the addition to the Minneapolis Artificial Ice Plant. Reconnecting the present outfit, rearranging switchboard, panels, and conduit in the old plant, and furnishing 2300-volt new oil switches, circuit breakers, and meters. 5. A 2300-volt installation for the Twin City Box Co., and another 2300-volt installation for the Minneapolis Manufacturing Co. 6. The Beck Electrical Construction Co. has equipped over 175 apartments this season with complete electrical installation of lighting, signal systems and telephones. In a number of these installations fixtures and lamps have also been furnished.

George B. Fraley, 36 South Main street, Liberty, N. Y., has just installed a 110-volt Edison storage battery plant at Grooville, N. Y., for Koon Brothers. The plant will be used to furnish light for three large turning mills, residences, stores, and other buildings. Most of the fixtures will be of semi-indirect type. Another job recently finished by this contractor included the wiring and installating of semi-indirect lighting electric signs in the Homer Hotel and cafe at Jeffersonville, N. Y.

Fred. Tischer, 612 Twentieth avenue, East, Duluth, Minn., reports the electrical contracting business in Duluth as unusually quiet, building operations being suspended until warmer weather sets in. He is now wiring a two-story bungalow for J. A. Erickson.

Harvey J. Doyle, 71 East 43d street, Chicago, has just completed the following electrical contracts: The wiring for the Ajax Storage Battery Co., at 1446 Wabash avenue, Chicago; the Ross Boiler Co., 3600 Shields avenue, Chicago; the J. C. F. Royer apartment building at 3824-26 Rhodes avenue, Chicago, consisting of forty flats.

James D. Thomas, 32 East Franklin street, Waynesburg, Pa., has recently completed the following jobs: J. J. Purman, $60,000 home, in which conduit was used throughout. Among the apparatus installed is a complete interphone system, also domestic call and burglar alarm systems. Beardslee fixtures were used. Other jobs include the Manufacturers Light & Heat Co., Pennsylvania State Armory, Co. K, Tenth Regiment, and the J. L. Garard, $40,000 residence, the latter being one of the largest knob and tube jobs ever done in residence work in that section. Mr. Thomas has under contract at the present time the following jobs: Large motor installation for Waynesburg steam laundry, large annex and the present structure of the M. E. Church, also wiring contracts for dwellings, stores and public buildings.

The Underwriters' Electric Construction Co., located at 327 South La Salle street, Chicago, Ill., has been organized to carry on an electrical contracting business. This company will also handle the usual line of electrical supplies.

Sherman & Komar, electrical contractors, 57 Lawton street, New Rochelle, N. Y., have the electrical contract at the Convent of Perpetual Rosary, West Hoboken, N. J. It calls for about 200 outlets, all installed in rigid iron conduit. Slate panels and flush switches will be used throughout. Other jobs now in hand include the electric wiring and fixtures in the enclosing corridors at the U. S. Hospital at Ellis Island, New York Harbor. This work is all installed in iron conduit, slate panels, and heavy spun copper fixtures. They also have the contract for the complete electric wiring in the Beaux Arts Society Building at No. 126 East 75th street, New York. This job consists of about 175 outlets installed in B X cable, panels and flush switches. The fixtures are all indirect, furnished by the Black & Boyd Co. Still another contract calls for the entire electrical work in two fireproof apartments at Bronxville, N. Y. This work consists of about 900 outlets installed in pipe, panels, Diamond "H" switches, and base plugs, also a DeVeau telephone system of 40 stations, and bell and annunciator work, in each apartment.

Harvey J. Doyle, electrical contractor, has removed from 4418 Wabash avenue, to 71 East 43d street, Chicago, Ill.

Charles Pfotzer, electrical contractor, Fourth street and Maple avenue, Hamilton, Ohio, is installing, complete, a Wagner rotary converter system in the Jefferson Theatre. He has recently wired the W. H. Renick residence, a $10,000 home in Middletown, Ohio, for electric lights, bells, buzzers, and power. A stationary vacuum cleaner plant was installed in the basement by him, with remote control on each floor. He will also hang the fixtures. The service to Hamilton's new Y. M. C. A. has recently been run by him. Besides the above mentioned, Mr. Pfotzer has several small contracts on hand.

The A. C. Scribner Electric and Heating Co. have the contract to equip the H. D. Peter's Co. wood turning and novelty factory with their electric motor power and light system. This will be one of the most modern and up-to-date installations known to the consumer. This installation includes 18 Crocker-Wheeler magnetic bridge induction motors. Each machine will be driven by its own motor and will be started and stopped by special drum oil type switches mounted on the machine close by the operator. The sizes of the motors will range 2 h.p. to 15 h.p. All wires will be installed in galvanized conduit. The lighting system is also in conduit and consists of 16 enameled steel shades and 100-watt mazda lamps placed 20 ft. apart, two rows through each floor, set alternately, and controlled individually by snap switches mounted on the post in the center of the building. Beside each large lamp there will be a drop cord in line with the lamp equipped with a Hubbel chandelier plug attachment to permit quick and easy connections for extension cords.

The F. M. Grant Electric Co., 1529 Prospect ave., S. E., Cleveland, Ohio, has recently completed the electrical work in the new building of the Enamel Products Co., of Cleveland. The contract called for the installation of 200 lamps and 100 h.p. in various sizes of motors, also the feed wires and control devices for operating these lamps and motors.

The United Electric Construction Co., 110 So. Dearborn street, Chicago, has been awarded the contract for the electrical work in the three story and basement Harris Hall of Political Science at Northwestern University, Evanston, Ill. High grade materials will be used throughout, and the lighting will be by direct fixtures. Service will be furnished by the power house on the grounds, which furnishes lighting current, single phase, 60-cycles, at 115-230 volts; also power current, 3 phase, 3 wire, 60 cycle, at 230 volts. Some of the materials which will be used on this job includes the American Circular Loom Co.'s X-duct, General Electric wire, Hart & Hegeman switches, and Bryant receptacles.

The board of directors of the Wilkes-Barre, Pa., Private Ward Hospital has awarded the electrical contract for the proposed new hospital building in Wilkes-Barre, to Shepherd & Rust, electrical contractors of that place The indirect "eye comfort" system of illumination has been generally adopted throughout the entire building. The patients' rooms and corridors have the fixtures doubly wired, so that the maximum illumination can be used during the early evening, and just a small amount of illumination for the balance of the night. Wall switches control all these units and the desired amount of illumination can be obtained by successive pushes on the wall button. The power installation for motors and heating apparatus is just as completely covered as the lighting. Separate and individual lines carry current from the source of power to motors for operating a vacuum cleaning system, a refrigerating system, ventilating system, a nurses' signaling system, passenger and freight elevators, and a dumb waiter. Heating units are installed for sterilizing work, and care is also taken for electrotherapy work and X-ray apparatus. There has been installed a complete telephone system, consisting of a central station with switchboard, from which point lines are run to each of the patients' rooms, so that communication with the outside can be established from any point in the building. Intercommunication between any of the several points in the building can be just as readily accomplished.

The signal equipment in this line will consist of the Holtzer-Cabot nurses' signal system. There is installed at each patient's bedside, a four-way calling and emergency station. In the corridor over each door, there is installed two electric lamps, one frosted and one red. There is also installed in the diet kitchen, in the nurses' duty room, and in the physician's office, a combined signal and lamp indicator. The balance of the system, consisting of the ordinary elevator signals, door buttons, plugs for reading lamps, are all taken care of in the same exact detail as is described in the special features above enumerated.

W. A. Beile & Co., electrical contractors, 25 East Washington street, Chicago, have closed a contract with Kussel & Harris, architects and general contractors, 30 North La Salle street, Chicago, for the electrical work for a three-story and basement bachelor hotel building on the corner of Leland avenue and Sheridan road. The building is so constructed that it may be changed to an apartment building at any time the owner desires. Work will be started within the next month. This concern also has contracted with the same people for a store and theatre building at 4730 Sheridan road that will have a seating capacity of about 1,500 people. There are approximately 400 outside lights on the front of the building. Concealed border lights are run along the top of all windows on the second floor. Over the entrance will be a row of ornamental lights with a row of concealed border lights above and another row of ornamental and concealed lights at the top of the building. All outlets will be installed in terra cotta.

The wiring of the Palace Theatre at Grand Rapids, Mich., will be chiefly of the knob and tube variety. The contract for this job has been let to the Natwick Electric Co., 342 Grand avenue, Grand Rapids, Mich. The flylights will be the new style nitrogen lamps with special reflectors. The house lights will be ornamental X-Ray shallow bowl fixtures with four 150-watt mazda lamps in each. The contractors are also installing a Wagner rotary converter set for the moving picture outfit. The front of this theatre will be lighted with 150 10 or 15 watt mazda lamps. These are arranged around the inside of the lobby and in the front archway. The other rooms in the theatre will be lighted with ordinary drop cord fixtures.

The Herman Andrae Electrical Co., Inc., 135 Sycamore street, Milwaukee, Wis., has the contract to wire the post office at Salem, Ohio, a conduit job.

V. N. Cleary, electrical contractor of Windsor, Vermont, is wiring the new grammar school at that place. This building is to have eight school rooms, each with a large cloak closet on the main floor, and a large auditorium, boys' play room, girls' play room, toilets and teachers' room in the basement. The main floor rooms are to be lighted from a saw tooth roof in addition to side windows, the greater portion of the ceilings being glass. The wiring plans call for six outlets in each school room, one in each cloak room, five in the corridor, fourteen in the auditorium, two in the teachers' room, two in each toilet, three in the boiler room, and four in each play room—a total of 90 lights inside, in addition to which there are to be two pillar lights and eight clock lights outside. The current is brought into the building underground in No. 4 lead covered cable laid in 2-inch iron conduit, to a jackknife switch located in the boiler room, from which it is carried to a cabinet in the center of the main corridor in No. 6 double braid wire laid in 1¼-inch iron conduit. This cabinet contains a panelboard of 18 two-wire circuits. The clocks, of which there are one in each school room, one in auditorium, and one outside, are controlled by a master clock located in the teachers' room. This master clock also controls the bell system, consisting of two gongs outside and three inside the building. About 500 feet of ½-inch conduit, 120 feet of 1¼-inch conduit, 650 feet of No. 14 wire in B X cable, 250 feet of No. 6 double braid wire, and 1,200 feet of No. 14 double braid wire have been used.

The Electric & Auto Co., 203-5 Fifth street, Lorain, Ohio, has the contract for the electrical work on the high school building at Lorain. The wiring will all be incased in conduit. The motors will be direct current. They will be operated with current from a 50-k.w. generator in the boiler room at the high school. This generator is now installed and being used to operate motors on the ventilating system. The fixtures will be one-light unit type, suspended from the ceiling on short chains. The main switchboard will be installed in the meter room with separate circuits running to each tablet board. The tablet board will be installed in steel cabinets with steel door and trim, with three-inch gutter.

The Marshall Electric Co., of Marshalltown, Iowa, is wiring the new school building at Melbourne, Iowa The wiring installation is made up of a combination conduit and knob and tube. All the classrooms, the domestic science department, and the laboratories have two ceiling openings, the assembly hall four, and the gymnasium six. All ceiling openings are controlled by switches. Floor plugs and baseboard receptacles will be installed in the assembly rooms, the domestic science department, and the laboratory for the attachment of electric devices. A special tap in the assembly room provides for a picture machine. The cabinet panel is Crouse-Hinds and all switches are Perkins flush plate. The job about roughed in at this time. This company has just finished the roughing in of a two-story and basement school at Van Cleve and also one at Baxter, Iowa. The construction of these schools is similar to that at Melbourne, with the exception of the fireproof corridors and the latter two having knob and tube work in their entirety. Work at present is rather slack in that part of Iowa, but the prospects for spring business is good.

J. J. Duck, 430 St. Clair street, Toledo, Ohio, has the wiring of the two-story and basement garage and service station at the corner of 10th and Adam streets, Toledo, for the Blevins Auto Sales Co., who handle the Studebaker car. The wiring consists of steel armored cable and conduit. He also wired for a 15-h.p. elevator motor, and two 3-h.p. blower motors, and installed a large sign on the building, using five hundred 10-watt mazda lamps, reducing the alternating current by means of sign transformers, to a voltage of 13. Throughout the building there were installed 35 Type C, 200-watt, promotion fixtures of Holophane make, also a complete installation of mazda lamps. All wiring in conduit was of Americore manufacture.

Robert P. Buckland, electrical contractor, College Point, N. Y., is installing the electrical equipment in the St. Agnes Parochial School, at Rockville Center, L. I. The school will be lighted by 386 lamps, the stage equipment to consist of foot, border, strip, arc, and spot lights. Another job, recently completed, consisted of concealed rewiring in the home of the Misses Alger and Grace, at Great Neck, L. I. Here rigid iron conduit was used throughout, special pains being taken to prevent damage to walls, ceilings, or floors. This job was done in eight weeks. Other jobs consisted of the wiring of Aloysius Roman Catholic church, at Great Neck; the electric equipment of the North Side Bank, of 718 Grand avenue, Brooklyn; the residence of T. R. Congdon, 26 East 70th street, New York; the convent of the Sisters of St. Dominic, at Ridgewood, L. I.; Queensborough Labor Lyceum, Myrtle avenue, Ridgewood, L. I.; home and garage of Martin Metzer, Huntington, L. I., and the home of M. Peters, at Jamaica, L. I. Mr. Buckland will spend February and March with his family at West Palm Beach, Fla., taking a side trip of a few weeks to Havana, Cuba. He spent two months in Florida last winter and hopes to continue these winter diversions indefinitely. While in Florida last winter he called on the trade at different cities. He found competition keen and profits meagre.

J. G. Weller, 305 Second street, Brownsville, Pa., has the contract to install the electrical equipment in the new eighth ward school building in Uniontown, Pa. The building will have five classrooms on the first floor, an auditorium and four classrooms on the second floor, and four large rooms in the basement will be used for manual training and playrooms. The building will be fireproof.

The Valley Electric Supply Company, Inc., 11 North Second street, North Yakima, Wash., is wiring a building at North Yakima, consisting of a sub-basement, basement, first, and second floors. The structure is of reinforced concrete, tile and native stone. The electric work consists of approximately 200 lamp outlets, 50 base plugs, 200 flush switch outlets, 14 intercommunicating telephones, 3 public phones, eight-point automatic annunciators, two 5-h.p. elevators—all to be in conduit.

Chas. G. Lemon, 115 South Market street, Galion, Ohio, has the contract to wire in conduit the three-story store and apartment building now being put up by F. L. Myers, at 108 East Main street, Galion, O. He also has the contract to wire the Wisler store and flat building at 217 East Main street. He reports electrical business in Galion as good.

A hollow tile and frame construction building in Congdon Park, Duluth, Minn., now being built for Mr. Barnes, of the Duluth Board of Trade, will be wired on the knob and tube plan by E. F. Bradley, 4411 Regent street, Duluth, Minn. The electrical construction is modern in every respect, and ample provision has been made for heating and small power apparatus. A special feature is the lighting outlets and units, all the lamps being controlled by conveniently placed switches. This contractor has recently completed wiring the home of B. P. Neff, which is similar in construction to the house specified above. The largest job this contractor has had this season was the wiring of the model city belonging to the Minnesota Steel Co. This job included 170 buildings of different types, housing 350 families. Black enameled conduit was used throughout, the buildings themselves being constructed of concrete blocks. Two car loads of conduit were used.

GLEANINGS FROM THE N.E.L.A. QUESTION BOX

Reprinted from the Bulletin of the National Electric Light Association.

Have member companies found any way to stop the humming of meters in service without taking them from the wall and overhauling them? If so, how is it done?

F. B. Patterson—Humming caused by loose laminations is often-times overcome by the tightening of the screws holding these in place, although sometimes a removal of the meter may be necessary. Noise in the jewels of the ball-bearing type of meter can be remedied by using jewels which are cupped more and are not so shallow. Humming at the top bearing is eliminated often by a small drop of oil placed in the bearing. At other times it is necessary to use heavy felt washers between meter and wall when mounting the meter. In the G. E. type I and Fort Wayne type K it will be necessary to install the latest type of flexible top bearing and in the type K this will necessitate the changing of the main shaft also, due to the difference in construction.

Louis W. Pratt—The humming can often be stopped or considerably lessened by using ⅛-inch felt washers about 1 inch in diameter around the screw holes for supporting the meter.

Louis B. Zeiger—The humming of meters may, in a good many cases, be stopped by replacing either the jewel or the upper bearing, especially when this is of the spring type as in the G. E. type I meter. The tightening of all screws, especially those clamping laminations, is advisable, and quite often it reduces or stops the humming.

Occasionally, the humming of a meter may be stopped by re-setting it, especially in cases where the meter is mounted on a weak wall or partition which acts as a sounding board in amplifying sound which would otherwise be unnoticed. Where a new location is not possible, rubber or felt washers placed under the supporting screws of the meter might prove of value in absorbing the vibration which causes the humming. In one case known to the writer the humming of a meter in the attic of a residence was so reinforced by its particular position that the sound could be heard in almost every room in the house. This was overcome by re-setting the meter on more solid support.

Where other methods have failed humming has been stopped by fastening a wire tightly around the wing-nut post and the magnet of a meter. The tension of the wing-nut post seems to absorb the vibration of the meter mechanism.

On 13,000-volt 3-phase transmission lines of approximately 15 miles in length, has much trouble been experienced from lightning where no overhead guard wire is installed? Have member companies, once using such transmission lines without guard wires, afterward installed the guard wires and by so doing practically eliminated trouble from lightning?

Q. A. Bracket—It is not customary nor practicable to protect a transmission line as such by means of lightning arresters. It is pretty well established, however, that the use of an overhead ground wire carried on the tops of the poles and well grounded as frequently as possible, preferably at every pole, affords a great deal of protection to the line and consequently, to the station apparatus as well. Wherever lightning conditions are severe enough to warrant the expense, an overhead ground wire will be found to give valuable protection. The station apparatus on a 6,600-volt, 3-phase system should be protected according to the value of the apparatus and the importance of continuity of service. If the system is small, the more expensive lightning arresters might not be warranted. The best protection for the station apparatus is undoubtedly afforded by the electrolytic type of arrester. This can be used only where there is attendance, so that the necessary daily charging can be carried on. Where men are not available, or where the expense of an electrolytic arrester is not warranted, an arrester of the low-equivalent type, consisting of a number of spark gaps of non-arcing metal in series with a resistance, a portion of the gaps being shunted by another resistance, will afford the next best protection. If the capacity of the station does not exceed 2,000 kilowatts the series resistance will not be required. If outdoor distributing transformers of considerable size are used, these should be protected by arresters of the non-arcing metal spark-gap type, arranged for outdoor mounting. In all cases, the lightning arresters must be well grounded.

Does the element of time enter into the figuring of horse-power (not horse-power hour)? Kindly explain as fully as possible.

Please give the formulæ for figuring the horse-power of a gas engine and a steam engine.

What is an indicated horse-power?

L. Erwin Baumgarten—Power is the rate of doing work. A horse-power is a definite rate of doing work and is 33,000 foot-pounds per minute or 33,000 pounds raised vertically one foot in one minute, or one pound raised 33,000 feet vertically in one minute or any combination of force and distance which will give 33,000 foot-pounds per minute.

The formula for figuring the horse-power of an engine is $\frac{PLAN}{33{,}000}$. Here P = mean effective pressure; L = stroke in feet; A = net area of piston in square inches and N = numbers of revolutions per minute.

It is better to work out the horse-power of an engine by reasoning rather than to substitute quantities in a formula without understanding their derivation.

In the above formula P, the mean effective pressure, multiplied by the net area of piston in square inches gives the force acting throughout the stroke. This force multiplied by the stroke in feet gives the work in foot-pounds per stroke and the product of this work per stroke by the number of revolutions per minute gives the foot-pounds of work per minute, which is the rate of doing work. This is for one end of the cylinder, the total horse-power of the engine being the sum of the horse-power of the crank and head ends.

J. C. Hobbs—The element of time does enter into the unit horse-power because the unit represents the *rate of doing work,* and not some definite amount of energy, as represented by the units horse-power hour, kilowatt-hour, or the basic unit of the English system, the foot-pound.

I am building a 48-mile transmission line, and shall step the voltage from 2,300 up to 22,000, and on the other end step it down to 2,300 volts. A customer 15 miles out wishes service for a 25-h.p. motor. How will this affect the line, how should I step it down and what type and voltage of motor should be used? There is a small town about 25 miles out that I wish to serve which will use about 2,000 lamps in all. Under the conditions given how many times should the line be transposed, and why?

Thompson Cummings—If there is a probability of securing any business within a radius of a few miles from the power customer, it might be advisable to furnish him with a 220-volt motor, fed from 22,000-2,200-volt, 3-phase or single-phase transformers, which will permit the extension of lines of that voltage to take care of such business as may develop in his vicinity. The service required will determine which type of motor is best. The starting currents of a motor of this size will not affect the line regulation to any extent. If the load in the small town is not too much scattered, it may all be fed from a 110-220-volt bank, or party secondary, this voltage being secured in one transformation from the line voltage of 22,000, with the secondary neutral point grounded for safety.

The voltage given, 22,000, seems to be a rather low potential for a 48-mile line and my experience is that most companies are using 33,000 volts when it is necessary to exceed 11,000, as this provides a generous margin for future developments and still does not bring one into the field of extra high voltage work.

The modern tendency is to eliminate line transpositions except where the line parallels telegraph or telephone leads, in which case the high-tension wire should be given two turns of one-third of a revolution each, so spaced that the high-tension line is divided into three equal parts. If these transpositions are of the dead end and jumper type they will be useful as line sectionalizing points in locating trouble.

Frank S. Hatch—It is a very common practice to tap high-tension lines for motor connections, but as the installation described is small the cost will be very high per horsepower. The starting of the 25-h.p. motor will have no bad effect on the line if the motor has a good auto starter and is not started under load.

The voltage can be stepped-down direct from 22,000 volts to 440 volts by using the standard transformer made by several of the manufacturing companies—three 10-kw. transformers mounted on a 4-pole fixture with a set of disconnecting switches and fuses. It is also advisable to install a set of electrolytic lightning arresters.

The transformer for the town load should step-down from 22,000 to 2,300 or 4,000. These, too, can be outdoor type, but as they will be larger it would be best to place them on the ground and inclose them with a tight wire fence for safety. Switches and protective apparatus will be same as for the motor connection.

In regard to transposing: if it is desired to get good voltage regulation at the end of the line and if there is a telephone line near the power line it will be advisable to transpose quite often, say every two or three miles.

Ivor L. Kentish-Rankin—The motor load is so small that it would have no appreciable effect upon the transmission line. The type of motor to use depends upon conditions to be met; an induction motor of the squirrel-cage type answers average requirements, but if especially high starting torque is necessary a motor having a variable resistance secondary should be used.

The motor should be fed from three transformers of such capacity that if one transformer fails the other two can carry the load. A motor wound for 440 volts would probably be the most economical.

Unless telegraph and telephone lines are in very close proximity to the high-tension line there will be no need to transpose the latter.

L. M. Klauber—For the prospective power customer we would step down to 220 volts, 3-phase, using two 15-kw., 2,200/220-110-volt transformers in open delta. This will be cheaper than the installation of three 10-kw. transformers by about 35 per cent., and will be perfectly satisfactory. The motor should be 220-volt, 3-phase, and current for lighting could be furnished from one of the transformers if desired.

The small town 25 miles out, estimating the average lamp connected at 50 watts, would require a total connected load of 100 kilowatts; and if the demand factor were 25 per cent., which is an average condition in suburban communities, a 25 or 30-kw. transformer should be provided. If the load is concentrated we would step down to 220-110 volts and distribute over three-wire secondaries; if it is scattered, it would be advisable to step down to 2,200 volts and distribute at this voltage, using 2,200/220-110-volt transformers, as required at load centers.

Although the load at the end of the line is not given, we assume that the line wire used will be no smaller than No. 6, in which case tapping these small loads from the line will have no appreciable effect on the regulation.

Transposing the line will be unnecessary unless there are parallel telephone lines near the transmission lines which would be subject to inductive interference. If such be the case, transpose at the sixteenth and thirty-second mile, or better still, at the following distances: 5⅓, 10⅔, 21⅓, 26⅔, 37⅓ and 42⅔ miles.

Would the efficiency of a mercury arc rectifier be increased if it were possible to operate it without the reactance coils in circuit? If so, what percentage of increase in efficiency would be obtained?

***Ivor L. Kentish-Rankin*—The direct-current obtained from a mercury rectifier is the combination of two half-waves of alternating current superimposed one upon the other, and the resultant wave is not uniform but pulsating or undulating. The function of the reactance coil is to overcome the pulsating character of the single-phase source and maintain a steady flow of power. The effect of the ripples upon the ruggedness of the undirectional wave depends largely upon the amount of reactance in circuit.**

If there were no reactance in circuit when the current from one electrode dropped to zero the bulb would go out, it being the energy stored by the reactance that maintains the circuit from one position of the bulb until current has started to flow from the other.

The equivalent of this reactance may be obtained by introducing leakage between the two halves of the transformer in the supply circuit; the magnetic field which is built up between the two windings then acts as the equivalent of the reactance coil, while the transformer continues to perform its original function.

RECENT LEGAL DECISIONS

Of Special Interest to Electric Light and Power Stations

Care Required

An instruction to the jury that a telephone company and an electric company were required to "exercise that reasonable care consistent with the proper operation of their business which would be observed by reasonably prudent persons under like circumstances and to increase the care with any change in conditions likely to increase the danger, and having due regard to the existing state of science and invention," was held not to be objectionable as requiring them "to purchase every freak device turned out, and take the chance of its being a success or a failure," but only required such care as is commensurate with the danger involved in handling electricity, namely, the highest degree of care practicable under the circumstances, and was as favorable to such companies as the law will permit.

South Bend Home Telephone Co. v. Beaning, Indiana Supreme Court, 105 N. E. 52.

Wires in Inaccessible Places

An electric company maintained uninsulated wires at a distance of 8 or 10 feet from the sidewalk, and inaccessible by anyone in the ordinary or usual use of the sidewalk. A boy, some seven years old, climbed up a pole supporting an awning, and, while walking along the horizontal bar supporting it, came in contact with an electric wire, and was injured. In an action against the electric company, there was evidence that the plaintiff had been forbidden to climb the pole and no evidence that the defendant knew that boys were accustomed to climb it. It was held that the defendant was not liable.

O'Gara v. Philadelphia Electric Co., Pennsylvania Supreme Court, 90 Atl. 529.

Taxation of Gross Earnings of Electric Light Companies

Section 186 of the New York Tax Law (Consol. Laws, c. 60), imposes a tax upon the gross earnings of companies supplying gas, water, or electricity, and provides that the term "gross earnings" means all receipts from the employment of capital without deduction. It is held that an electric light company is not entitled to have deducted from its gross receipts the amount paid by it to a power company for electricity purchased, notwithstanding the fact that such amount enters into the gross earnings of the selling corporation and is taxed against it.

People ex. rel. Genesee Light & Power Co., New York Appellate Division, 147 N. Y. Supp. 726.

Attractive Nuisance Doctrine—Injury to Children

It is held that, if a telephone company was negligent, when stringing wires, by using a pulley and rope which was pulled by a team, in not guarding the appliance or warning children away from it, when it knew that they were attracted by it and were allowed to play with the rope or pulley, the fact that a boy was a trespasser in taking hold of the rope would not prevent a recovery for resulting injuries to him. As some of the cases put it, the attractive character of the appliance was such as to create an implied invitation to the children to use or put their hands on it. Or, as other cases put it, the negligence of the defendant was the primary and proximate cause of the injury, and the trespass the secondary or remote cause, and in either event, if the defendant was negligent, the technical trespass of the child does not defeat recovery.

Ashbach v. Iowa Telephone Co., Iowa Supreme Court, 146 N. W. 441.

Electric Lineman—Duty to Inspect Imposed by Light Company's Rules—Assumed Risk

The degree of care required of an electric company for the protection of its linemen and the extent of the risk assumed by a lineman, are, it is held, to be measured and determined by the terms of the lineman's employment, the rules or custom of the company as to the inspection of wires, or other special circumstances affecting the duties and obligations of one or both of the parties. So, the duty to inspect wires for the lineman's own safety may be imposed upon him by the terms of his employment or the custom or rules of the company. An electric light company required its linemen to inspect and repair wires from which the insulation had been broken, and furnished tape to linemen for that purpose. An experienced lineman was killed by coming in contact with a heavily charged wire from which the insulation had been removed. It was held that he had assumed the risk of injury from such a cause, and hence no recovery could be had for his resulting death.

Shelton v. Kirksville Light, Power & Ice Co., Missouri Supreme Court, 167 S. W. 544.

Pole Accident—When Conflicting][Evidence—Questions for Jury

In an action against an employer for injuries from the falling of an electric light pole on which the plaintiff was climbing, it was held to be a question for the jury whether it was negligence of the employer to permit a switch to be out of repair or removed from the pole, or to permit old poles to remain in use at the time of the accident without testing or repair. It was also held to be for the jury to decide whether the plaintiff knew or ought to have known the defective condition of the pole. He testified that when he climbed the pole it was all right, so far as he knew, being supported by two guy wires, and that he supposed it to be perfectly safe; so that the court could not take the case from the jury by a judgment of non-suit. A motion was made for an instructed verdict for the defendant, which was denied. It was held, on appeal, that this motion was dependent largely upon the defense set up in the answer that the plaintiff was the foreman in charge of, and responsible for the condition of, the poles and switch, upon which there was a dispute in the evidence, and therefore the defendant was not entitled to a directed verdict. Judgment for the plaintiff was affirmed.

Powell v. Sutherlin Land & Water Co., Oregon Supreme Court, 140 Pac. 998; rehearing denied, 141 Pac. 1016.

Definition of "Electric Light Works"

The board of trustees of a town determined by resolution to build an electric light plant and issue bonds therefor, and submitted the question to the voters. The election was in favor of building the plant and issuing bonds. It was held that the act of the board in purchasing poles, wires and equipment at an expense in excess of the bond issue, and contracting with another for the purchase of electric current to light the town, was unauthorized and a diversion of the proceeds of the bonds, and would be enjoined at the suit of a citizen and taxpayer. The electric light works contemplated by the Indiana statute, Burns' Ann. St. 1908, §8921, as amended by Acts 1911, c. 561, empowering any city or town to erect electric light works and issue bonds therefor on the vote of the people of the town, includes not only the equipment and appliances necessary to receive and carry an electric light current, but also a generating plant. Therefore, when a town votes to erect an "electric light plant" and issues bonds therefor, the erection of wires, poles, and other appliances for the receiving and carrying of electric current furnished by another is not the erection of electric light works within the statute.

Cooper v. Town of Middleton, Indiana Appellate Court, 105 N. E. 393.

Jurisdiction—Dissolution of Lighting Corporation

Two warrants to dissolve a $10,000,000 corporation, supplying 95 per cent. of the electric light in the city of St. Louis, and subject, under Missouri Rev. St. 1909, § 2976, to an incorporation fee of $5,025, presents a controversy involving an amount within the appellate jurisdiction of the Supreme Court of the State.

State ex. rel. Union Electric Light & Power Co. v. Reynolds, Missouri Supreme Court, 165 S. W. 801.

No Recovery for Injury Sustained in Prior Accident

An employee who sustains a personal injury negligently inflicted, cannot recover for injuries sustained in a prior accident; and, unless the jury can determine what portion of the injuries were caused by the negligence complained of, there can be no recovery.

Texas Power & Light Co. v. Burger, Texas Civil Appeals, 166 S. W. 680.

Liability for Injuries to Employe of Independent Contractor—Degree of Care Required

An electric light and power company made a contract for the painting of its transformer station, and an employee of the contractor, not familiar with the premises or the appliances, was injured by coming in contact with uninsulated and unprotected loose wires which were not obviously dangerous, and in regard to which he had received no warning. It was held that an action of damages might properly be prosecuted by the employee of the contractor against the light and power company. The court held that the employee of an independent contractor doing work on the premises of another is an invitee by special agreement, and the proprietor of such premises is under obligation to see that he have a reasonably safe place to work, and that he have reasonable protection against the consequences of hidden dangers. The rule adopted in Idaho as to the care required of electric companies is that they "are held to the highest degree of care practicable to avoid injuries to persons who may accidentally or otherwise come in contact with their wires. Electricity is recognized as one of the most destructive agencies we have, and the highest degree of care and diligence is required by those who are operating electrical plants in order to avoid injury to person and property." Judgment for the defendant was reversed, and the cause remanded.

Gagnon v. St. Maries Light & Power Co., Idaho Supreme Court, 141 Pac. 88.

Injuries to Children—Dangerous Premises

An electric power company erected a transformer on the property of a manufacturing corporation, and the keys of the building were in the possession of the latter. The agents of the power company worked in the building a day, following which a window, with unprotected wires heavily charged within five or six inches, was left open. Children constantly played about near the window, and one of them was injured by coming in contact with the wires. In an action against both companies it was held that there was sufficient evidence of their negligence to require submission of their liability for the injuries to the jury. Whether the maintenance of the wires in such a position was the maintenance of a nuisance attractive to children, so as to create a liability for injuries to a child coming in contact with a wire was held, under the evidence, to be a question for the jury.

Hayes v. Southern Power Co., South Carolina Supreme Court, 78 S. E. 956.

Standard of Care—High Voltage Wires Crossing Private Land

A light and power company maintained along a road a high power line, of which the lower wire, carrying 16,500 volts, was suspended within 17 feet of the ground and overhung a farm abutting on the road. This wire was insulated. While fixing an irrigation flume, the farmer inadvertently brought an iron pipe in contact with the uninsulated wire and was immediately killed. In an action for his death it was held that, under the evidence, the questions of the defendant's negligence and the deceased's contributory negligence were for the jury. The test of the defendant's negligence was not whether the particular accident could have been ascertained, but whether a person, following his usual vocation where he had a right to be, might be injured by the current. The degree of care required of one handling electricity was held to depend upon the danger from the current, slight care being sufficient where the current would not injure persons with whom it came in contact, and the highest care being necessary where the current would be fatal to human life, as in the case of a high tension wire in a dangerous position.

Card v. Wenatchee Valley Gas & Electric Co., Washington Supreme Court, 137 Pac. 1047.

MANUFACTURERS' NEWS

James T. Boustead, the man who installed the first dynamo in Minneapolis, has opened offices, a salesroom and a shop for the Boustead Electric and Manufacturing Co., at 215 First avenue north. "Jim" installed the first dynamo in Minneapolis in 1881 at the Falls Station below the apron, in the plant of the old Brush Electric Co., now the General Electric Co. For five years he acted as superintendent of this firm. In 1885 he installed the first electric motor in Minneapolis at the Swineburn Printing Co. offices. He installed the 250-foot light mast on Bridge square, remembered by all the older residents and in 1884 decorated it for the G. A. R. encampment. He organized the Electric Machinery Co., 23 years ago, resigning only recently to become active manager of his new company. The Boustead Co. will manufacture motors up to 50 h.p., as well as switchboards and panelboards. It will handle a complete line of generators and electric machinery. Mr. Boustead, the first of this month, purchased the entire plant of the United Electric Motor Works, of Menominee, Wisconsin, and has moved the same to Minneapolis, and consolidated it with his own plant. The Menominee plant consisted of a complete line of dynamos and motors and a special line of submerged motors for pleasure boats.

Edwards Lighting & Fixture Co. is the name of a new corporation located at 65 East Lake street, Chicago. L. J. Georgen is president; L. V. Hult, treasurer, and John L. Cushing, secretary. For a number of years these men were connected with the W. S. Edwards Mfg. Co., of Chicago. This concern is putting out a complete line of lighting fixtures.

The Partrick & Wilkins Co. has bought all the assets, except the book accounts, of Partrick, Carter & Wilkins Co., of 51 North 7th street, Philadelphia. The new concern will be located at the old address and will continue to manufacture the same line of needle annunciators and electrical house goods.

The Howard Miniature Lamp Co., Inc., Ampere, N. J., has sold its assets to the General Electric Co.

The Independent Electric Mfg. Co., of Milwaukee, Wis., has gone out of business. Its successor is the Industrial Controller Co., of Milwaukee.

The Detroit United Railways Co. has placed an order with the Westinghouse Electric & Mfg. Co. for a 50-ton Baldwin-Westinghouse locomotive. This machine is to be used between Royal Oaks, just outside the city limits of Detroit, and Flint, a distance of about 55 miles. Flint is a thriving city of about 40,000 population located in the heart of Michigan. The freight between the terminals and intermediate towns is composed chiefly of less than carload movements. The Detroit United Railways, after considerable investigation, selected a standard locomotive type instead of the car-type locomotive with which this class of service has been previously and is at present handled. The locomotive will be equipped with Westinghouse No. 301-D-6 field control slow speed motors especially designed for locomotive application, and pneumatically operated unit switch control.

The Greater New York Metal Box Co., formerly at 60 Grand street, New York, has removed to 110 West 17th street.

Thomas M. Harrigan, maker of the well-known "Harrigan" splicing links and insulators at Woodstock, Vermont, is distributing the most useful 1915 calendar that has come to us this year. It is a loose-leaf desk and wall daily, with a separate leaf for every day in the year. As implied by the name, it can be hung on the wall, or stood on the desk, at a convenient angle.

The officials and staff of the Meadows Mfg. Co., Pontiac, Ill., had a two-day conference at the office and factory on January 1-2, 1915. They talked shop, planned for the next year's work, dined at the Imperial Hotel, and heard the officials and heads of departments report that during the last year, a dull one in most lines, the company's business was large and prosperous.

The Delta-Star Electric Co., Chicago, Ill., is distributing Bulletin No. 15, devoted to high tension indoor equipment. It contains 80 pages, has a total of 188 illustrations, and lists approximately 1,200 different types of switches, fuse mountings, and choke coils. Ten pages are devoted to technical data of interest to engineers, who can secure copy of this publication upon application.

The Burke Electric Live Wire Club held a lively meeting at the office of the company on January 8. Lunch was served by the company at 6 o'clock, after which the second annual election was held, the following executive committee being elected for the present year: H. A. Brown, president; G. Irving Blake, vice-president; F. C. Brecht, J. O. Merwin, N. Fuller. This organization is composed of foremen and heads of the various departments of the Burke Electric Co., of Erie, Pa., and has a membership of seventy-three. It holds an annual banquet during the winter months and also takes care of the annual shop picnic.

Several weeks ago the foundry in the factory of the Robbins & Myers Co., Springfield, Ohio, was damaged by fire. A number of fans made by this company were buried in the ruins, blistered by heat, and covered with débris and ice. They were dug out with picks by the workmen. Out of curiosity one of the officials of the company turned current into two of them, an 8-inch desk fan, and a 12-inch oscillator, both alternators, to see what would happen. After the current had been turned on long enough to melt the ice in the motors both fans started rotating, throwing the water out in a spray. They continued to operate without mishap as long as the current was on, though somewhat out of balance owing to mechanical injuries. Electrically, they seemed as good as new.

The only change this season in the line of electric fans made by the Westinghouse Electric & Mfg. Co., is the substitution of new 56-inch and 58-inch direct current ceiling fans for the 54-inch and 57-inch fans formerly supplied. The increasing use of fans in the home has made it advisable to include a separable attachment plug and eight feet of cord with each desk-and-bracket fan.

The Diehl 1915 fan bulletin descriptive of the Diehl Mfg. Co. line of electric fans is just off the press, also a booklet entitled "Diehl to Dealer Sales Helps," which describes and illustrates the company's advertising campaign for agents.

The exhibit of the General Electric Co. in the Transportation Building at the Panama-Pacific International Exposition will be extensive, and will comprise electric locomotives for various classes of service including steam railroad electrification, railway motors and all kinds of apparatus and accessories for electric railways, signal accessory electric devices, electric apparatus and equipment for railway shops, and electric illumination for cars and shops. An interesting feature of the exhibit will be the new G. E electric locomotives.

The M. W. Dunton Co., 150 Niagara street, Providence, R. I., is now distributing copies of its new folder known as "Soldering Kinks, No. 4." A copy of this folder will be sent to anyone applying for it. Contractors will find it useful.

The Westinghouse Electric & Mfg. Co. reports the receipt of orders for equipment from the following operating companies: Nevada Valleys Power Co., Oakland, Cal.; Puget Sound Light, Power & Traction Co., Seattle, Wash.; Philadelphia Electric Co., Philadelphia, Pa.; Potomac Electric Co., Washington, D. C.; Virginian Power Co., Dacota, W. Va.; Cushing Traction Co., Cushing, Okla.; Washington-Virginia Railways Co., Washington, D. C.

W. N. Matthews & Bro., of St. Louis, Mo., have received a letter from Takata & Co., of Tokio, Japan, announcing that the exhibit of Matthews electric light, power, telegraph, and telephone apparatus, sent to the recent Taisho Exhibition in Tokio, was given a prominent place and awarded a souvenir medal.

The Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., reports orders for electrical apparatus from the city of Buffalo, N. Y.; Central New York Gas & Electric Co., Geneva, N. Y.; Hocking Sunday Creek Traction Co., Nelsonville, Ohio; Steubenville & East Liverpool Railway & Light Co., Steubenville, Ohio; town of Toronto, Ohio.

Electric ranges made by the Standard Electric Stove Co., of Toledo, Ohio, have been installed for cooking purposes in a Buffalo, N. Y., apartment hotel. The outfit contains 30 No. 285 ranges and 65 No. 185 ranges, representing a connected load of 300 kilowatts. The owner purchases electricity from the central station through one meter on a wholesale basis and will install in each apartment a submeter of his own and agrees to supply the tenant with electric light and service for electric cooking at rates less than the consumer could obtain as an individual customer of the company, which he is able to do at a profit to himself by reason of his purchasing electric service on a wholesale basis. This is said to be the most extensive electrical cooking outfit so far installed.

The DeVeau Telephone Mfg. Co., 472 Eighteenth street, Brooklyn, N. Y., has recently supplied the electrical contracting branch of the industry with materials for installation at the following places: J. P. Morgan building, New York; Chase National Bank, New York; Royal Bank of Canada, Canada; Dominion Bank of Canada, Canada; Aetna Life Insurance Co., Hartfard, Conn.; Consolidated Gas Co., New York; Frick residence, New York; State Barge Canal, Albany, N. Y.; Grover Cleveland High School, St. Louis, Mo.; Bay Ridge High School, Brooklyn, N. Y.; Buffalo Normal School, Buffalo, N. Y.

BRANCH OFFICES AND AGENCIES

Do you want an agent? If so, we will put the notice here free. The same privilege is extended to agents desiring to represent manufacturers.

On page 198 our readers will find an advertising section, giving the local address and telephone number of manufacturers' agents and branch offices of out of town concerns. The constant inquiries coming to the Electrical Record for this information caused this section to be started. It will be found especially useful by persons wanting immediate information. As a time saver it will be appreciated.

The Greenwich Sales Co., 257 Broadway, New York, wishes to establish agencies and apportion exclusive territory for the sale of its safety electric vaporizer known as the "Vaporel." This is a new device for fumigating, disinfecting, and deodorizing. It can be attached to any electric light socket.

The Corbett & De Coursey Co., of Pittsburgh, which handles electrical specialties, is in a position to promote the sale of goods of a new or novel nature which are especially demanded by mill, mine, and railway companies. At the present time they would like to add one or two good lines for this class of trade or the trade in general.

L. Elgee, 17 West 112th street, New York, who is well acquainted with the electrical trade, and who for the past six years has been representing a New York electrical concern, wishes to acquire the New York and suburban district agency for manufacturers of electrical merchandise.

Thomas B. Rhodes, for several years associated with the United Electric Engineering Corporation, has accepted a position with the Sangamo Electric Co., of Springfield, Ill. Mr. Rhodes will begin by having charge of the company's business with the various electric light and power syndicates and will be located at the New York office, 50 Church street.

The Canada Sales Co., P. O. Box 292, Toronto, Canada, is open for lines of electrical goods. The company wishes to act as factory representatives on a commission basis.

The Robbins & Myers Co., Springfield, Ohio, has appointed Mr. C. R. Hunt and Mr. Guy H. Gibbs to take charge of their exhibits at San Francisco and San Diego, respectively.

H. B. Tremble, 124 West Newell street, Syracuse, N. Y., has been appointed New York State agent by the National Electric Co. He will handle both wholesale and retail lines.

The American Manufacturers' Agency, Inc., Wm. H. McKinlock, president, Chicago, has taken the selling agency for the Crawford Cedar Co., of Menominee, Mich., and will quote prices on a full line of the material manufactured by the Crawford Company.

The Wagner Electric Mfg. Co., Saint Louis, Mo., announces the opening of a sales office in the Pioneer Building, Saint Paul, Minn. C. Kirk Hillman, who for some time has been identified with the sales of Wagner apparatus in that territory, will be in charge.

The American Manufacturers' Agency, William H. McKinlock, president, 111 Monroe street, Chicago, Ill., announces that it has taken the agency for the Novelty Incandescent Lamp Co., Emporium, Pa., manufacturers of all classes of incandescent lamps.

The Electrical Alloy Co., of Morristown, N. J., has opened an office at 180 North Dearborn street, Chicago, Ill. This office is in charge of L. L. Fleig & Co., who have been appointed western representatives.

Fred. Tischer, 612 20th avenue, East, Duluth, Minn., has taken the agency for the Blaisdell Machinery Co., makers of vacuum pumps.

Jos. G. Bixon has severed his connection as southern representative for the Giese Mfg. Co., of Philadelphia and will in the future represent the Biddle-Gaumer Co., of 3846 Lancaster avenue, Philadelphia, in southern territory.

The Trumbull Electric Mfg. Co., Plainville, Conn., has opened a branch office at 595 Mission street, San Francisco, Cal. W. P. Maser, for some years their Western representative, who is familiar with the needs and business conditions in the West, will be in charge. A large line of "Circle T" goods will be carried in stock, and all ordinary requirements of the trade on the Coast will be taken care of.

The Hart Mfg. Co., of Hartford, Conn., announces that it has appointed Frank E. Watts as district manager in charge of its New York office, at 203 Broadway, New York.

The Zinke Co., Inc., 1322 Michigan avenue, Chicago, represents in that territory the Temco Electric Motor Co., of Leipsic, Ohio.

JOBBERS AND DEALERS

James H. Hughes, secretary of E. B. Latham & Co., has recently resigned his position with that company to become general manager of the Alpha Electric Co., Inc., 116 West 29th street, New York. Mr. Hughes has been identified with the electrical business for the past twenty years and is well known by the trade. Twenty years ago he entered the employ of J. H. Bonnell & Co., later becoming associated with the Manhattan Electrical Supply Co., then at 36 Cortlandt street, New York. He acted in the capacity of buyer for this company for three years. In 1899 he accepted an interest with the firm of E. B. Latham & Co. and continued with that company in the capacity of secretary for fifteen years, when he resigned to enter the business referred to above.

The Philadelphia Electric Company Supply Department, 132 South 11th street, Philadelphia, is marketing a line of high tension station and open-air potheads known as the "Franklin." The construction of these potheads embodies high factors of both safety and economy, and requires no plumbers' wiped joints. These potheads and other central station specialties are being handled through the jobbing houses.

Theodore Klaus, dealer in gas and electric fixtures and supplies at New Brunswick, N. J., has removed from 28 Place street to larger quarters at 29-31 Place street. He has bought the building in which he is now located.

T. J. O'Brien, formerly secretary and sales manager of the Electrical Supply & Equipment Co., of Hartford, Conn., has resigned from this company to become president and sales manager of Ward, Drouet & Foster, Inc., of Boston.

M. G. Francoeur, formerly connected with the Electrical Supply & Equipment Co., of Hartford, Conn., is now in charge of the service department of Ward, Drouet & Foster, Inc., of Boston.

The Stuart-Howland Co., 234 Congress street, Boston, Mass., is distributing a 1915 calendar which shows a map of Central Europe with the fortified cities marked in red ink. The company will send one of these calendars to anyone making application for it.

Chas. G. Rabinowitch, dealer in electrical specialties, 48 Warren street, New York, wishes to notify the trade that pursuant to an order of the Supreme Court of New York, his name in future will be Chas. G. Robin. Mr. Robin finds that the shorter name is less of a handicap in conducting business, hence the change.

A folder entitled "Selling Fans" has recently been distributed among electrical jobbers, contractors, and dealers by the Western Electric Co., 463 West street, New York. This folder is sent to the trade in order to stimulate the sale of fans during the coming season. It contains a large variety of attractive "sales helps" in the shape of catchy illustrations. These illustrations show in various forms the many purposes for which fans may be used. They include lantern slides, window displays, display cards, and advertisements in local newspapers. The lantern slides, window display paraphernalia, and display cards, also electrotypes for local newspaper advertising, will be sent free upon request to any contractor, jobber, or dealer. The company announces six prizes ranging in value from $50 for the first prize to $5 for the sixth prize for the best six fan window displays submitted by September 1, 1915. The rules governing the contest state that the foreground of the window display must be originated and dressed by a member of the firm or by an employee. The display is to remain in the show window not less than one week. Each contestant must procure photographs at least 5 by 7 inches of his window at his own expense and mail a print to the Western Electric Co. The window must contain as its basis a fan display, the fan or fans entering into the display to be taken from stock. The size of the display will not be the deciding factor. This contest will be conducted by the *Western Electric News*. Photographs should be mailed to "Contest Editor, *Western Electric News*, 463 West street, New York City." The committee of award will consist of representatives from the electrical press and The Society for Electrical Development.

The Public Electrical Supply House recently started in business at 58 Essex street, New York. This concern will deal in electrical supplies. The members of the firm, A. K. Peshkin and N. J. Feinberg, were formerly in the electrical contracting business at 3 Rutgers place, New York.

Owing to the disastrous fire which destroyed the retail branch of the Havens Electrical Supply Co., Inc., at 465 Broadway, Albany, N. Y., the company would appreciate it if fixture manufacturers, with whom it has been dealing, and others, would send immediately their latest catalogues and prices so that the company's files may be brought up to date as quickly as possible. Address catalogues to the Havens Electrical Supply Co., Inc., 31 Hudson avenue, Albany, N. Y.

PERSONAL

H. W. Cope, formerly assistant manager of the industrial and power department of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has been appointed director of the company's exhibit at the Panama-Pacific Exposition at San Francisco.

Chas. L. Benjamin, who has been advertising manager for the Cutler-Hammer Mfg. Co., Milwaukee, for the last eight years, has resigned that position in order to become associated with Klau-Van Pietersom-Dunlap, Inc., of Milwaukee. Mr. Benjamin's work in the electrical field has been unusual. He is one of a few men who has the happy faculty of injecting life into ordinary dryasdust stuff. He can be accurate technically and interesting and entertaining from a literary point of view at the same time. His comment on the development of the wheel-barrow, published in our issue for August, 1913, is a case in point. It shows him at his best. Aside from his present day and more recent activities, Mr. Benjamin has acquired efficiency, judgment, and poise from various other experiences during the last 20 years. At one time he was editor of *Printers' Ink;* at another time he had charge of the publicity work for the *Century Magazine*, the Century Dictionary, and many of the Century Co.'s book publications. In that capacity he had the good luck to be a pupil of both Richard Watson Gilder and Theodore L. De Vinne. At one time he was editor of the *Suburbanite*, a monthly magazine of rare merit published by the Central Railroad of New Jersey. He had a turn at soldiering as a trooper in the Spanish-American war. One of his traits is that he doesn't talk unless he has something to say.

George Kirchgasser has been appointed advertising manager of the Cutler-Hammer Mfg. Co., Milwaukee, Wis., succeeding Charles L. Benjamin, who recently resigned to take up advertising work in Milwaukee. Mr. Kirchgasser has served as assistant advertising manager of the company for the last four years.

John J. Gibson, formerly manager of the Philadelphia office of the Westinghouse Electric & Mfg. Co., has been appointed manager of the detail and supply department in that company's works at East Pittsburgh, Pa. In this position he succeeds G. B. Griffin who has been appointed manager of the automobile equipment department.

H. Thurston Owens, until recently secretary and general manager of the San Diego (Cal.) Gas and Electric Appliance Co., has become associated with the lighting fixture house of Bayley and Sons, with headquarters at 101 Park avenue, New York. Mr. Owens has been in the lighting business for fifteen years with the Consolidated Gas Co., the *American Gas Light Journal*, and general manager of the La Crosse (Wis.) Gas and Electric Co.

Errett L. Callahan, chairman of the Commercial Section of the National Electric Light Association, and for the last six years manager of the new-business department of H. M. Byllesby & Co., Chicago, has resigned his position with the Byllesby company to become Chicago district manager for the Westinghouse Lamp Company.

OBITUARY

Marshall L. Barnes, Troy, N. Y., one of the most energetic and aggressive presidents that the National Electrical Contractors' Association has ever had, died suddenly at his home in Troy in December. His death removes an enterprising and popular man from the contracting branch of the industry.

Charles Martin Hall, inventor of the electrolytic process for the manufacture of aluminum and vice-president of the Aluminum Co. of America, died on December 27 in Daytona, Fla. He began his experiments in 1885, when aluminum was selling at $25 a pound, and a year later discovered the process which materially reduced the cost of manufacturing it and is now universally used. He began to produce aluminum in his own factory at Kensington, near Pittsburgh, later erecting larger factories at Niagara Falls. Priority was conceded to the Hall patent in 1893. Mr. Hall received the honorary degree of LL.D. from Oberlin College in 1910, and the following year he was awarded the Sir William Perkin gold medal.

Philip H. Rutter, of the Newark Electrical Supply Co., 281 Market street, Newark, N. J., died at his home in that city on December 28 last.

ASSOCIATIONS AND SOCIETIES

The editor of the Ohio Electric Light Association *Monthly* has but scant respect for the legislators of that state. He looks on the convening of the Ohio lawmakers as little short of a calamity. There are, he says, at least twice as many men holding positions as are necessary to do the work of the state. These men are paid out of the taxes, and the public utilities have to bear a good share of the burden. This burden must in turn be shunted to the public in the way of charges for service. The editor is of the opinion that one way to better the service of the public utilities in every particular is to give the present force of political office holders jobs of some sort where they will have something else to do besides travel and draw pay.

The midyear meeting of the American Electric Railway Association was held at Washington, D. C., on January 29. Among the speakers were Dwight W. Morrow, of J. P. Morgan & Co., who discussed electric railways from the bankers' standpoint; N. C. Kingsbury, vice-president of the American Telephone & Telegraph Co., who spoke on publicity; and Col. T. S. Williams, president of the Brooklyn Rapid Transit System, whose subject was the code of principles adopted by the association at its last convention.

"European Boiler Room Practice and Boiler Efficiency Methods in the United States, with Reference to Electric Light and Power Plants," was the title of a lecture given by William A. Blonck before the New York Electrical Society on January 13, 1915.

The Electrical Contractors' Association of Wisconsin met at Milwaukee, Wis., January 18 to 20. Open sessions were held on January 19. In the morning H. P. Andrae, of Julius Andrae & Sons Co., Milwaukee, spoke on "The Jobber in the Field," and D. E. Roberts of "The Contractor in the Field."

The Western Association of Electrical Inspectors held its tenth national or "tin wedding" convention at Minneapolis, Minn., January 26-28, 1914. The Hotel Radisson was used as headquarters. The tin wedding nature of the convention was responsible for an unusually large and diverse social program, the social program including visits to art galleries, receptions, card parties, automobile rides, dinners, thé dansants, and theatre parties. Among the papers presented were the following: Address, "Electrolysis, Its Detection and Mitigation," Burton McCollum, electrical engineer, Bureau of Standards, United States Department of Commerce; address, "Approved Fittings and the Label Service," J. E. Latta, Special Agent, Underwriters Laboratories, Inc.; address, "Principles Entering Into Valuation of Public Utilities and Rate Making," Chas. L. Pillsbury, consulting engineer.

A "Made In The U. S. A. Industrial Exposition" to be held at the Grand Central Palace, New York, March 6 to 13, is the latest development in the nation-wide movement to popularize and permanently establish the "Made In The U. S. A." slogan or national trademark and increase American industry and trade. This exposition is designed to show "American Made" and "American Grown" products in practically all branches of business and it is held at a time of the year when New York is the mecca of mercantile buyers from every section of the United States and this army of merchants is to be supplemented this year by a large number of South American and other foreign buyers who have heretofore gone to Europe at this same season.

A lecture on lighting for sight-saving was recently given before the pupils of the Washington Irving High School, by Mrs. C. B. Lyman. In connection with this address, exhibits showing good and bad lighting, both by gas and electricity, were arranged in the exhibition hall outside of the auditorium. The electrical division was provided by The New York Edison Co. In addition to the lamps and fixtures, the pupils were shown photographs illustrating the points of correct and incorrect illumination, and literature on the same subject was distributed, including more than 500 copies of the Lighting Primer of the Illuminating Engineering Society.

The Southwestern Electrical & Gas Association looks forward to an active and increasingly useful line of work this year. It is one of the best regulated electrical societies in the country. It has a wide-awake secretary who knows what the members want, and gives it to them.

At a meeting of the Council of the Illuminating Engineering Society, held January 14, 1915, M. Luckiesh, chairman of the committee on school lighting, submitted the manuscript of a paper entitled: "Safeguarding the Eyesight of Children." This paper, with some seventeen or eighteen slides, is to be used for a lecture on school lighting for presentation at meetings of school authorities throughout the country.

The seventh annual convention of the Wisconsin Electrical Association was held at the Hotel Pfister, Milwaukee, January 21-22, 1915. Among the papers read were the following: "Advertising Influence of Public Service Employees," by R. P. Jasperson; "The Wisconsin Railroad Commission's Method of Rate Making," by E. N. Strait; "Increased Taxation in Wisconsin and Its Effect on Public Service Companies," by Edwin Gruhl; "One Man Electric Car Operation in a Small City," by R. M. Howard; "The

Latest Tendencies and Developments in Street Lighting and Incandescent Lamps," by S. L. E. Rose; "How to Overcome Some Operating Difficulties of Small Electric Utilities," by J. N. Calby and C. B. Hayden; "Experience and Suggestions for the New Business Department of a Small Electric Utility," by C. M. Oxford.

The regular monthly meeting of the Board of Directors of the American Institute of Electrical Engineers, was held at 29 West 39th street, New York, on Friday, January 8, 1915. The board confirmed the appointment by President Lincoln of Ralph D. Mershon as a member of the Edison Medal Committee to fill the vacancy caused by the resignation of W. D. Weaver. Upon the recommendation of the Meetings and Papers Committee, authority was granted to hold Institute meetings in Cleveland, Ohio, March 18 and 19, and in Pittsburgh, Pa., April 15 and 16, both meetings to be under the auspices of the Industrial Power Committee, with the co-operation of the Cleveland and Pittsburgh Sections, respectively. Gano Dunn was unanimously reappointed by the board as one of the Institute's representatives upon the Board of Trustees of the United Engineering Society, for the term of three years ending on the fourth Thursday of January, 1918. The secretary announced that in accordance with Section 21 of the Institute By-laws, President Lincoln would become a member of the John Fritz Medal Board of Award on the third Friday of January, vice past president Dugald C. Jackson, whose term will expire on that date.

A pictorial review of the past year's business of the Edison Electric Illuminating Co. of Brookyln by T. I. Jones, general sales agent, was the feature of the January meeting of the Brooklyn Company Section, held January 12.

The National Electric Light Association will hold its next annual convention at San Francisco, June 8-11, 1915.

On January 7, John H. Stutt lectured on "Music as a Fine Art," before the Philadelphia Jovian Electrical League. The Philadelphia league is perhaps the most active and versatile of all the Jovian bodies. It is operated by a coterie which believes in keeping it alive.

The American Institute of Electrical Engineers will hold a mid-winter convention in New York City on February 17, 18 and 19. A Panama-Pacific convention will be held in San Francisco during the week beginning September 13.

On Wednesday, evening, January 27, at the Engineering Societies Building, 29 West 39th street, New York, a meeting was held to announce the beginning of The Engineering Foundation. Speeches were made by Gano Dunn, Henry S. Pritchett, Robert W. Hunt, and Alexander C. Humphreys. The Engineering Foundation is the name given to a fund to be devoted to the advancement of the engineering arts and sciences, to the welfare of the engineering profession, and to the betterment of mankind in general. The donor of the initial gift to be used for this purpose is Ambrose Swasey. The gift is $200,000.

ELECTRICAL DEVELOPMENT SOCIETY

The society is distributing a pamphlet which contains a key to the manufacturers of the electrical household devices referred to in the booklets "Electricity in the Home" and "Household Electricity" issued last month.

Since the last meeting H. C. Spaulding has resigned and has been succeeded by H. W. Alexander, who now has charge of the editorial and advertising departments. Mr. Alexander has had the management of the publicity and sales work of the Federal Light & Traction Co., has been assistant city editor of a Chicago daily newspaper and a contributor to the press and magazines for some years.

The society has also engaged Miss Grace T. Hadley, who entered upon her duties January 1. Miss Hadley was at one time an associate editor of *Popular Electricity*. She will have charge of the publicity work of the society dealing with household devices, particularly with the work intended to appeal to the women users of such devices.

Acting upon a suggestion advanced by the Society for Electrical Development, representatives of leading electrical manufacturers, central stations, jobbers, contractors, dealers, and trade journals, at a special meeting held Friday, January 8, in the society's office, voted in favor of planning a great national electric week to be held in the United States and Canada some time this autumn. It was decided to recommend to the Board of Directors of the society to make this a big sales and educational week, during which time all affiliated interests would co-operate with national manufacturers and civic bodies, to boost for the better lighting of streets, stores, factories, schools and homes, and it will be the aim of the movement to promote the sale of electrical appliances, motors, in fact, everything electrical, and to aid the development of the electrical industry by conducting house wiring campaigns in every city. It was the consensus of opinion of those present that such a week would be of great value to everyone engaged in the electrical industry, as it would call the attention of the public to the many uses of electricity, would stimulate the men in the industry itself, and impart a boom to general business throughout the entire country. It was decided to recommend to the Board of Directors at its next meeting that the society promote a national electrical carnival week, the choice of the committee being the week beginning October 18.

An epitomized record of the nation's growth in area, population, and resources is contained in a pamphlet just issued by the Department of Commerce through its Bureau of Foreign and Domestic Commerce, entitled "Statistical Record of the Progress of the United States, 1800-1914." In all cases where the statistical data permit, the tables cover more than a century; the later inauguration of certain lines of statistics necessarily restricts, in those cases, the period covered. The book is sold by the Superintendent of Documents, Washington, D. C., for 10 cents a copy.

FOREIGN TRADE OPPORTUNITIES

The Bureau of Foreign and Domestic Commerce maintains branch offices in eight commercial centers, where business men may more readily avail themselves of the service of the Bureau. Reserved addresses in connection with "Foreign trade opportunities" and all lists of names offered in connection with articles published in Commerce Reports may be obtained from the nearest office by application in letter form. The list of offices follow: New York, 409 United States Customhouse; Chicago, 629 Federal Building; New Orleans, 1020 Hibernia Bank Building; San Francisco, 410 United States Customhouse; Atlanta, 52 Post Office Building; Seattle, 922 Alaska Building; Boston, 752 Oliver Building; St. Louis, 402 Third National Bank Building.

The daily issued by the Bureau of Foreign and Domestic Commerce and heretofore called *Daily Consular and Trade Reports,* will hereafter be called *Commerce Reports.* This change became effective on January 1.

No. 15061. Miniature Auto and Flashlight Tungsten Lamps.—A firm of wholesale merchants and importers in Canada has informed an American consul that it desires to be put in touch with manufacturers of and dealers in miniature auto and flashlight tungsten lamps.

No. 14626. Electric Glassware, Flash Lamps. Etc. —A firm abroad is desirous of communicating with manufacturers in the United States of electric glassware, flash lamps, and batteries for such lamps.

No. 14975. Electric Pocket Lamps and Dry Batteries.—An import agent in northern Europe advises an American consular officer that he desires to hear from American exporters of electric pocket lamps and dry batteries.

No. 14971. Electric Light Hand Lamps.—An American commercial attaché in a foreign capital advises that there is a market in that country for electric-light hand flash lamps for the use of pedestrians. The lamp should retail at about $1. The attaché remarks that prompt action on the part of exporters of these articles should result in large sales.

No. 15144. Searchlight Carbons.—An American consular officer in the East Indies reports that a navigation company in his district is desirous of being placed in communication with manufacturers in the United States of carbons for searchlights. Catalogues, price lists, and full descriptive matter should be sent at once. It is stated that the firm can furnish satisfactory references. Correspondence may be in English.

No. 15220. Electric Lighting Fixtures.—An American consular officer in Canada reports that a firm in his district desires to be put in touch with American manufacturers of electric-lighting fixtures, with a view to representing them in that market on a commission basis.

No. 14966. Searchlights.—A neutral Government advises an American consular officer that it is in the market for six or eight searchlights for the army and navy; also portable searchlights, with gasoline engines, or with Edison accumulators. It is stated that the searchlights should be of 60 to 90 centimeters, and 1 meter to 50 centimeters in diameter; that they should be provided with the necessary electric power—14 horsepower for the smaller, and 35 horsepower for the larger lights. Catalogues, or photographs, and price lists should be sent to the American consular officer.

No. 14899. Arc-lamp Globes, Etc.—A consul reports that an importing firm is desirous of purchasing arc-lamp globes, electric cables, and electric-light accessories. Illustrations of the arc-lamp globes desired accompanied the report and may be examined at the Bureau of Foreign and Domestic Commerce and its branch offices.

Electrical Supplies, Etc., No. 15312.—An American consul in Europe has transmitted a detailed report relative possibilities for the sale of American electrical supplies, excavating, hydraulic, and mining materials in his district. A copy of the report may be had on application to the Bureau of Foreign and Domestic Commerce and its branch offices.

No. 14968. Electrical Supplies.—A firm in the West Indies informs an American consular officer that it desires to be placed in communication with American firms exporting electrical supplies of all kinds. Materials for wiring houses, etc., are desired in particular.

No. 14876. Elecrtical Supplies, Etc.—An American consular officer in Asia Minor reports that a commission house in his district desires to place orders for electrical supplies of all kinds—electric lights and bulbs, electric motors and dynamos, oil and water pumps, horizontal and vertical Diesel motors, gas pipes, and high-pressure pipes. It is explained that the firm does not require credit, and wishes to establish relations with manufacturers of the highest-class goods. Correspondence should be in Russian, German, or French, and prices should be c. i. f. destination. References are given.

No. 15010. Electrical Supplies.—An American consular officer in Europe reports a general market in his district for all kinds of electrical novelties, such as lamps, and general electrical supplies. American firms interested in this opportunity should correspond with the consular officer.

No. 14977. Electrical Supplies.—A merchant in a European capital has informed an American consular officer that he desires to act as agent in his country for an American manufacturer of electric supplies, such as accumulators, electrical appliances for automobiles, dynamos, transformers, and wire installation. The merchant offers references as to his financial responsibility and is willing to give banker's security for such goods as he takes.

No. 14889. Electrical Household Appliances, Etc.—An American consular officer in Asia Minor reports the names and addresses of dealers in his district who are in the market for electrical household appliances, such as fans, irons, heaters, table and hanging lamps, brackets, bulbs, wire, sockets, etc., plumbers' tools and appliances, bathroom and toilet fixtures, taps, showers, coal or wood heaters, etc., builders' hardware, kitchen utensils, meat choppers, small coffee grinders and percolators, plated ware and cutlery, furniture accessories, such as handles, hinges, locks, and metal or wood ornaments, and petroleum stoves of all kinds.

No. 15184. ELECTRICAL SUPPLIES.—An electrical engineer of one of the leading cities in South America has requested an American consular officer to secure for him catalogues, etc., for electrical supplies, including wire, cable, and conduit, etc. Prices should be f. o. b. New York, or, preferably, c. i. f. destination. Catalogues in Portuguese are preferred.

No. 14950. ELECTRICAL GOODS, FURNITURE, CARRIAGES, ETC.—A business man in the East Indies informs an American consul that he wishes to receive catalogues and price lists from American exporters of electrical goods, dynamos, engines, furniture, carriages, labor-saving appliances, wearing apparel, shoes, and preserved goods.

No. 15251. TELEPHONE EQUIPMENT AND SUPPLIES.—An American consul in South America reports the name and address of a firm which is negotiating with the Government for the installation of a modern telephone system. It is stated that one member of the firm is an American.

No. 15164. OPTICAL GOODS AND ELECTRICAL APPLIANCES FOR WIRELESS TELEGRAPHY.—A business man in New Zealand has informed an American consul that he is desirous of getting into communication with manufacturers and exporters of optical goods and electrical appliances for wireless telegraphy. It is explained that he is particularly anxious to do business with firms on the Pacific Coast.

No. 15140. WIRELESS-TELEGRAPHY APPARATUS.—An American consular officer in one of the neutral European countries advises that a firm in his district wishes to communicate with American manufacturers of wireless-telegraphy apparatus, which may be used in field service. Catalogues and prices should be sent at once. Correspondence may be in English.

No. 14785. TELEPHONE SYSTEM.—An American consular officer in the Far East advises that a railway company in his district is planning to install a new telephone system for a municipality. Firms interested in furnishing electrical supplies, etc., should send catalogues and price list.

No. 14980. COPPER WIRE, TIN, ZINC, ETC.—A commission merchant in Europe informs an American consular officer that he wishes to correspond with American manufacturers of naked copper wire—electrolytic and commercial, silicium bronze wire, copper tubes and sheets, brass tubes and sheets, silver, platina, new silver, and lead wire, tin, zinc, and tinplate, dynamos, large and small electromotors, electric fans, stoves, kitchen utensils, material for electric-light installations, bells, telephones and apparatus, and all accessories for high and low current lines. Correspondence may be in English.

No. 15129. COPPER, BRASS, AND PHOSPHOR-BRONZE WIRE.—An American consular officer in the United Kingdom reports that a dealer in his district desires to be put into communication with manufacturers of copper, brass, and phosphor-bronze wire, and any other product of the allied branch of the electrical trade. Reference is given.

No. 15143. ELECTROLYTIC COPPER WIRE.—A merchant in Spain informs an American consul that he wishes to communicate with American manufacturers of electrolytic copper wire. Catalogues, prices, and samples should be sent immediately. Correspondence should be in Spanish.

No. 15017. VACUUM CLEANERS.—An American consular officer in Europe has transmitted the name and address of a number of dealers in household furnishings, etc., who may be interested in promoting the sale of hand-operated vacuum cleaners.

No. 14993. DRY CELLS.—An import agent in France has informed an American consul that he wishes to form connections with American manufacturers of dry cells for bells, for telegraphic and telephonic use, and for pocket lamps, and also of small electrical apparatus. He is desirous of obtaining terms to cover a stock of dry cells to be held at a distributive point.

No. 15001. INSULATORS FOR ELECTRIC TRANSMISSION.—A civil engineer, owner and manager of two stores in a European country, informs an American consular officer that he would like to hear from American manufacturers of insulators with a view of undertaking the exclusive sale of such goods in the country in which he is located.

No. 15243. ELECTRICAL APPLIANCES, RUBBER GOODS FOR AUTOMOBILES, ETC.—A firm in South America has informed an American consul that it desires to import electrical appliances in general, telephone and telegraph supplies, rubber goods for automobiles, pharmacies, and industrial purposes. Correspondence should be in Spanish.

No. 14618. ELECTRIC MACHINERY, DYNAMOS, TRANSFORMERS, MOTORS, ETC.—A merchant of high standing has requested the American consul to place him in communication with American manufacturers of dynamos, transformers, motors, switches, and materials for electrical installation, such as lamps and insulating tubing, electroliers, electric heaters, water boilers, and general domestic appliances. The consul states that this firm, with its several branches, does an extensive business. Correspondence may be in English.

No. 14872. ELECTRIC TRAMWAY CONSTRUCTION.—An American consular officer in Europe reports that a company in his district has filed an application for a franchise to build an electric tramway. The line is to be 31 miles in length.

No. 15182. ELECTRIC CRANES.—An American consular officer reports that a royal decree has been published authorizing the purchase of four electric cranes for use in the port of Valencia, Spain. Plans and specifications are on file in the office of the Secretaria de la Junta de Obras del Puerto de Valencia, Valencia, and in the office of the Ministerio de Fomento, Secion de Puetos, Madrid. A list of persons who are in a position to represent American firms may be obtained on application to the Bureau of Foreign and Domestic Commerce or its branch offices.

PUBLIC SERVICE NOTES

The earnings report of the Western Union Telegraph Co., Inc., for the year ended December, 1914, showed a net income of $5,161,422, an increase of about $2,000,000 over the preceding year. In this report the month of December, 1914, is estimated, not actual

The Texas Power & Light Co., a subsidiary of the Southwestern Power & Light Co., will expend about $600,000 on additions and betterments now in progress or to be undertaken during the current year. Among the improvements are the construction of a Diesel engine generating plant at Paris, Tex., and the construction of a transmission line to Honey Grove. A steel tower transmission line is to be built from the company's line at Norward to connect with a sub-station of the Texas Traction Co. near Dallas; a 2,000 kilowatt generator is to be installed at the McKinney generating station and the generating stations of the Texas Power & Light Co. at Denison and Sherman will be connected with the line supplying energy to the Texas Traction Co.

An analysis of the revenue derived from operation by the Pacific Gas & Electric Co., of California, shows that of the total gross revenue 51 per cent. is from the sale of electric current, 40 per cent. from gas, 4 per cent. from railway, and 5 per cent. from other sources. In all classes this company has a total of about 375,000 customers.

The personnel of the new Railroad Commission of California, which took office on January 4 under appointments from Governor Johnson, is the same as heretofore with the exception that Frank R. Devlin was named to fill the vacancy caused by the election of John M. Eshleman, former president of the commission, as Lieutenant-Governor.

The new contract for supplying electricity for street lighting in Chattanooga, Tenn., went into effect December 9. Under this contract Chattanooga receives a large increase in number of lights with a cost to citizens of less than nothing. All old series arcs will be replaced with 250 candle-power, nitrogen filled Mazda lamps. At this time Chattanooga is lighted with 380 series arcs and other lamps of different style, making a total of 593 street lights. For this number of lights the city has paid on an average of $2,300 per month. It is now proposed under the new contract to increase the street lights of better efficiency to 900 in number at a cost which has been estimated will not hardly exceed $17,000 per year. The old series arc lights of less efficiency than the proposed substitutes cost the city $70.08. The new lights will be acquired at a cost of $26.50, less than half the cost of the old lamps.

On January 6, subway traffic in New York, Brooklyn, and The Bronx, was suspended entirely for a number of hours owing to a short circuit in the cables in the manholes at 53rd street and Broadway, Manhattan. All the cables in two manholes were destroyed, affecting both the subway lighting and power circuits. As a result every train on the tracks, most of them loaded with rush hour traffic, came to a standstill. The cars that were caught near the short circuit were filled with fumes and smoke from burning insulation. There was some excitement, and several hundreds passengers were overcome by the fumes. They were removed from the trains stalled in that neighborhood by the fire department, the ladders being let down through the ventilator gratings. Immediately following this unavoidable accident there were numerous suggestions from the half-informed regarding the use of asbestos and other forms of power cable insulation. As no form of electrical insulation, asbestos or other, can withstand the tremendous heat generated in short circuited cables with the entire power house energy back of it, it is likely that instead of experimenting with untried insulations the Public Service Commission will order the cables so placed that should a short circuit occur the power and lighting circuits will not be affected at the same time, and such fumes and smoke as may arise will be vented in the street rather than in the subway. This is the first serious interruption of traffic that has occurred in the subway since it was opened over 10 years ago.

Application has been made by the Pacific Gas and Electric Co. to the California Railroad Commission for permission to issue $4,000,000 5 per cent. one year notes. Proceeds of the notes are to be used to retire the balance of the $7,000,000 one year 5 per cent. notes due March 25, 1915, of which about $3,000,000 were retired recently from the proceeds of the sale of preferred stock. No dividends can be paid on the common stock until the retirement of the outstanding notes, but it is understood that the agreement of sale of the new notes contains no such provision and that with the retirement of the notes due March 25 the way will be clear for the payment of common dividends. The new notes have been sold to New York bankers subject to approval by the commission.

After spending two hours going over the 1915 department estimate of the Department of Lamps and Lighting, the Board of Estimates of Baltimore has announced that it would tentatively grant the appropriation, minus about $35,000. Superintendent Mohr asked for an increase of $66,000 over last year. He said he needed the money to make a number of lighting improvements in various parts of the city.

The Tennessee Power Co.'s Sequatchie Valley transmission line was fully completed about the middle of December. Electric current was then thrown on from the $10,000,000 Brady power plant at Hale's Bar (of which Tennessee Power Co. is now the largest customer) to both the powerful three-phase conductor circuits. The triplex battery of electric generators has been connected by the Sequatchie Valley transmission line since the last of August, but only one of the three-phase circuits had been in full working order until mid-December, when the last bolt was tightened in the insulation of the last span where the new line crosses the Tennessee River in Marion county. The chief engineer of the Tennessee Power Co. declares that it is the last word in electrical transmission line construction, most permanently constructed one in the South, and the longest line of the kind, voltage capacity considered, in that part of the United States. The new line would have been completed much sooner except for the long time required to perfect the insulators at the river crossing.

INQUIRIES

Inquiries which we have been unable to answer have been received for the names and addresses of manufacturers of the articles listed below.

Replies from our readers to any or all of these are cordially welcomed both for publication here, and for incorporation as well in our Classified Index of Manufacturers.

In the interests of the good services which this department is expected to render, we would impress upon correspondents the advisability of making their inquiries as specific as possible. This will help materially in obtaining the desired information.

"ABC" National auto horn.
"New Easy" gas burner.
"Eddy" telephone receiver cord.
"Peerless" expansion bolt.
"Gates" cutout.
"Red-y" wire solder.
"Franklin" arc lamp.
"Vita" electric cooking apparatus.
"No Kair" electric stove.
"Zwicke" insulated wire.
"Bohler" magneto.
"Parmot" moulding.
"Climax" flat iron.
"Severn" gasoline engine.
Address of Try Fireless Cooker Co.
"Eureka" porcelain knob.
"Radio" electric hair waver.
"Rex" two light reflector.
"Utility" lantern.
"Rohne" electric heating pad.
"Emco" gauge tester.
"Learn-A-Code" (probably a self-instructor of telegraphy).

NAVY DEPARTMENT BIDS WANTED

The Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will open bids in the city of Washington on the date specified for the electrical supplies listed below.

Those who wish to submit bids should fill in the special application blanks, which are furnished by the Bureau on request, and should fill in these blanks with the numbers given in the "Sch." column in the list below on which they want to bid.

After having been properly filled out, these blanks should be mailed to the Bureau without delay.

The specifications will then be forwarded, or as soon as they are received from the Public Printer.

These specifications, or schedules, as they are officially called, may be obtained also by applying in the same way to the Navy Pay Office nearest each of the Navy Yards mentioned.

OPENING, FEBRUARY 2, 1915

Article.	Quantity.	Delivery at Navy Yard.	Sch.
Carbons, searchlight	4,000	Brooklyn, N. Y.	7803
Conductor, double	100,000 feet	do	7803
Cord, lamp	72,000 feet	do	7800
Cord, telephone	36,000 feet	do	7803
Motors, induction	Miscellaneous	Norfolk, Va.	7816
Wire, twin conductor	5,500 feet	Brooklyn, N. Y.	7803

CONSULTING ENGINEERS

Harry G. D. Nutting has been appointed manager of the engineering department of John E. DeWolf Co., investment bankers, Milwaukee, Wis. Mr. Nutting will assist the buying department in the investigation of public utility issues and will also have general charge of the public utility properties controlled by this company. Mr. Nutting was formerly an engineer for the Wisconsin Railroad Commission, has managed a number of municipally and privately owned properties, and was recently assistant to the president of the Wisconsin Public Service Co., Wisconsin Railway, Light & Power Co., and the Evanston, Ill., Railway Co.

A. T. Koehler, 922 Lehigh street, Easton, Pa., has been retained by that city as consulting engineer. Mr. Koehler's services have also been engaged as engineer to supervise the installing of a series nitrogen, tungsten lighting system. There will be one complete circuit of 117 single light standards of a design similar to the standards erected on Pennsylvania avenue, Washington, D. C. Each lamp will be rated 600 candle-power, 300 watt, 55½ volt, and the outer globe will be round and 18 inches in diameter. The standards will be spaced approximately 85 ft., and staggered The cable used will be Standard steel park cable, No. 6 B & S conductor solid, with 9/32 in. rubber insulation, lead encased, protected by two wraps of tarred jute and a double layer of steel spiral tape. Cable is guaranteed for a working potential of 8,000 volts and a breakdown test of 20,000 volts for five minutes. The cable will be placed in a trench 2 in. wide and 2 in. deep cut in the concrete bed of the street directly under the brick paving. Approximate cost of installation is $15,000, split up as follows: standards complete, $8,000; installing, $7,000. Power is furnished by the Pennsylvania Utilities Co., at the rate of 2 cents per kilowatt-hour.

NEW BOOKS

Complete and Plain Wiring Diagrams for All Purposes

This is a book of wiring diagrams in a loose-leaf binder. The purpose of the publishers is to furnish diagrams that are easy to understand by everyday wiremen.

The diagrams cover wiring for bells, electrical signals, lights, motors, generators, wireless outfits, rectifiers, boosters, automobile lighting, and other purposes.

The publisher's object is to help the purchasers as much as possible in understanding the diagrams so invites them to write for fuller descriptions where the diagrams are not quite clear to them. The price of this service will in every case be nominal. All supplementary information will be given in a size that will fit in the binder so as to become a part of the book.

It is published and copyrighted by V. C. Blott, 336 West Van Buren street, Chicago.

NEW CATALOGUES

De Laval Steam Turbine Co., Trenton, N. J.
Catalogue B. High efficiency centrifugal pumps, 300 pages.

Robbins & Myers Co., Springfield, Ohio.
Bulletin No. 111. Steel frame direct current generators, 6 pages.

Reynolds Electric Co., Chicago, Ill.
Bulletin No. 201. Type A alternating current motors, 4 pages.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Publication 1532 A. Automobile starting, lighting, and ignition systems, 32 pages.
Catalogue 3002-A, Section 3141. Motor driven bakers' and confectioners' machinery, 16 pages.
Folder 4205-A. Cooper-Hewitt rectifiers for moving picture service.
Leaflet No. 2485-A. Low pressure turbines.
Leaflet No. 3519-A. Direct current motors for group drive of sewing machines.
Leaflet No. 3520. Liquid rheostat for large a.c. slip ring motors.
Leaflet No. 3523. No. 328 commutating pole motor.
Leaflet No. 3707. Direct current motors for driving job printing presses.
Leaflet No. 3781. Type CI large slip ring induction motors.
Leaflet No. 3783. Lightning protection for cars.
Leaflet No. 3784. Type PK control for traction systems.
Folder 4292. Watthour meters for central station service.

Chicago Pneumatic Tool Co., Chicago, Ill.
Bulletin No. 34-K. Fuel oil and gas driven compressors, 24 pages.

Fahnestock Electric Co., Brooklyn, N. Y.
Catalogue No. 3. Spring binding posts, 20 pages.

Lagonda Manufacturing Co., Springfield, Ohio.
Catalogue L 8. Boiler tube cleaners, 32 pages.

D. & W. Fuse Co., Providence, R. I.
Circular No. 205. Magnetic chucks, 4 pages.

E. L. Russell Co., Indianapolis, Ind.
Booklets. Silent valve lighting and charging units.

General Electric Co., Schenectady, N. Y.
Bulletin No. 42010. Small turbo-generator sets, 14 pages.
Bulletin No. 42300. Steam engine driven generator sets, 12 pages.
Bulletin No. 45602. Lightning arresters for series lighting circuits, 8 pages.

Hurley Machine Co., Chicago, Ill.
Booklet. Electric home labor saving devices, 8 pages.

Steel City Electric Co., Pittsburgh, Pa.
Bulletin No. 25. Fish wire.
Bulletin No. 26. Fixture stems and beam straps
Bulletin No. 27. Outlet boxes for concrete work.
Bulletin No. 28. Conduit bushing adapters and hickey fixture hangers.

Harvey Hubbell, Inc., Bridgeport, Conn.
Bulletin No. 15-3. Sockets for mogul base lamps.
Folder. Reflectors.

Electric Railway Equipment Co., Cincinnati, Ohio.
Catalogue E. Single light lamp standards and brackets for type C lamps.

Morrison & Quinn, Rochester, N. Y.
Booklet. Ornamental concrete lighting standards.
Sheets. Concrete lighting standards.

Century Electric Co., St. Louis, Mo.
Folder. Single phase motors.

P. R. Manufacturing Co., Detroit, Mich.
Mailing card. Eclipse battery bell.

Life Saving Devices Co., New York.
Mailing card. Lungmotor.

Gray & Davis, Inc., Boston, Mass.
Booklet. Starting and lighting system for Ford cars.

JOVIAN LEAGUES

For the information of Jovians who visit any of the following cities we give below the time and place at which each of the several Luncheon Clubs meet:

Akron—Monday, 11:30 a. m., Black Whale Inn.
Baltimore—Thursday, 12:30 p. m., Emerson Hotel.
Bluefield—Last Saturday of month, 7:30 p. m., Altamont Hotel.
Boise—Every other Thursday, 12 m., Commercial Club or Owyhee hotel.
Buffalo—Saturday, 12:30 p. m., Lafayette Hotel.
Calgary—Twice a month, 12:15 p. m., Cronn's Rathskeller.
Charlotte—First and third Saturday of month, 1 p. m., Gem Cafe.
Chattanooga—Thursday, 12:30 p. m., Read House.
Chicago—Monday, 12:15 p. m., Hotel Sherman.
Cincinnati—Every other Monday, 12:30 p. m., Gibson Hotel.
Cleveland—Thursday, 12 m., club rooms, Hollenden Hotel.
Columbus—Every other Thursday, 6 p. m., and 12 m., alternately different hotels.
Dallas—Monday, 12 m., Oriental Hotel.
Dayton—First and third Monday of month, 12 m., Dayton Club.
Des Moines—Saturday 12:30 p. m., Kirkwood and Randolph Hotels, alternately.
Detroit—First and third Saturday of month, 1 p. m., Hotel Griswold.
Duluth—Second and fourth Tuesday, 12:15 p. m., St. Louis Hotel.
Erie—First and third Monday of each month, 6:30 p. m., Reed House.
Fort Wayne—First Tuesday of month, hour selected, Wayne Hotel.
Fort Worth—Tuesday, 12:15 p. m., at different cafes.
Galveston—Third Monday of each month, Harmony Hall.
Grand Rapids—First Saturday of month, 12:15 p. m., Association of Commerce.
Hartford—Thursday, 12:30 p. m., Bond's Cafe.
Houston—First and third Thursday of month, 6:30 p. m., Bender Hotel.
Huntington—Last Friday, each month, Frederick Hotel.
Indianapolis—Monday, 12:15 p. m., Hotel Severin.
Knoxville—First Tuesday of month, 12 m., Imperial Hotel.
La Crosse—Second and last Monday of month, 12 m., La Crosse Club.
Lethbridge—First Monday of month, 8 p. m., offices of Municipal Railway.
Lexington—First Tuesday after tenth of month, place to be selected.
Los Angeles—Wednesday, 12 m., Christopher's, No. 551 S. Broadway.
Louisville—Every other Monday, 12:30 p. m., different hotels and cafes.
Milwaukee—Every other Tuesday, 12:15 p. m., Hotel Blatz.
Minneapolis—Every other Tuesday, 12 m., breakfast room, Rogers Hotel.
Nashville—First and third Saturday of month, 12:30 p. m., Hermitage Hotel.
New Castle—Every Wednesday, 12 m., Y. M. C. A.
New Orleans—Second and Fourth Tuesday, 12:05 p. m., Hotel De Soto.
New York—Every other Wednesday, 12:30 p. m., Hotel Martinique.
Norfolk—Fourth Friday of month, 8 p. m., Lorraine and Lynnhaven Hotels.
Oklahoma City—Friday, 12 m., Skirvin Hotel.
Peoria—First and third Saturday of month, 1 p. m., Jefferson Hotel.
Philadelphia—Thursday, 12:30 p. m., Hotel Adelphia.
Pittsburgh—Thursday, 12:15 p. m., Fort Pitt Hotel.
Pittsfield—First Saturday of each month, 6:30 p. m., Wendell Hotel.
Portland—Thursday, 12:15 p. m., Hazelwood Restaurant.
Richmond—Fourth Tuesday each month, 1 p. m., Business Men's Club.
Rochester—Thursday, 12:15 p. m., Chamber of Commerce.
Sacramento—Saturday, 12:15 p. m., Peerless Cafe.
St. Louis—Tuesday, 12:30 p. m., American Hotel Annex, Sixth and Market streets.
St. Paul—Every other Tuesday, 12:15 p. m., Emporium Tea Room.
Salt Lake—Thursday, 12:30 p. m., Commercial Club.
San Antonio—Wednesday, 12 m., at St. Anthony Hotel, and on second Thursday of each month at 6:45 p. m., at different cafes.
San Francisco—Tuesday, 12:15 p. m., Hof Brau Cafe.
Schenectady—Third Wednesday of month, 12:15 p. m., Glenn's Restaurant.
Seattle—Friday, 12:30 p. m., Hotel Lincoln.
Sioux City—Thursday, 12 m., different hotels.
Spokane—Fourth Tuesday of month, 12 m., East Room, Davenport's.
Springfield, Ohio—Last Friday of month, 12 m., Commercial Club.
Syracuse—Saturday, 12:15 p. m., Empire Hotel.
Tacoma, Wash.—Tuesday, 12 m., Grill Room, Hotel Olympus.
Toledo—Saturday, 12:45 p. m., Commerce Club.
Toronto—Friday, 1 p. m., Prince George Hotel.
Twin Falls—Third Thursday, 7 p. m., Room 5, Power Building.
Waco—Thursdays, 12 m., Riggins Hotel.
Warren—Second and fourth Friday, 6:30 p. m., at different hotels and cafes.
Washington, D. C.—Wednesday, 12:30 p. m., Commercial Club.
Winnipeg—Second Wednesday of month, 12:15 p. m., St. Regis Hotel.

NEWLY APPROVED FITTINGS

Cabinets

Cabinets shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of National Board of Fire Underwriters. Made by Electric Operations Co., 254 36th street, Brooklyn, N. Y.

Conduit Outlet Plates

"National" sherardized steel outlet plates. Made by National Metal Molding Co., Fulton Bldg., Pittsburgh, Pa.

Fasteners

Fastener, Cat. No. 7026, for securing flexible tubing in end openings of switch boxes. Brass plated steel yoke with curved edges for gripping tubing at each end coinciding with end openings in box and secured by screw through center threading into back of box. For use only with switch boxes of this manufacturer. Made by Machen & Mayer Electrical Mfg. Co., 21st street and Fairmount avenue, Philadelphia, Pa.

McKinley No. 7 fasteners for securing ¼-in. trade size flexible tubing in switch and outlet boxes having ⅝-in. diameter knockout holes. Each consists of coppered steel collar formed to engage edge of knockout hole in boxes and has sharp projections to grip tubing. Made by Metal Specialties Co., 710 R. A. Long Bldg., Kansas City, Mo.

Fuses, Cartridge Enclosed

"Metropolitan" cartridge enclosed fuses, 61-100 amperes, 250 volts. Made by Metropolitan Engineering Co., 1240-1250 Atlantic avenue, Brooklyn, New York.

Hangers, Lamp and Fixture

Weatherproof suspension fittings. Standard for use with lamp clusters and reflector sockets on low potential circuits. Made by Benjamin Electric Mfg. Co., 120-128 S. Sangamon street, Chicago, Ill.

Lightning Rods

"Kretzer" copper cable weighing not less than 3 oz. per foot and with strands not less than No. 17 B. & S. gauge. Copper tubing not less than ⅝ in. in diameter and 1/32 in. thick. Star-section, twisted, hot-galvanized steel rod weighing approximately 5¼ oz. per foot. Star-section, twisted steel rod copper-plated and sheathed in No. 32 B. & S. gauge copper, and weighing 7 oz. per foot. Made by St. Louis Lightning Rod Co., St. Louis, Mo.

Signal Appliances

Factory signal horns. Type G, ratings 6-110 volt, direct and alternating current. Standard when installed with all wiring in compliance with Class C rules of the National Electrical Code. Made by Benjamin Electric Mfg. Co., 120-128 Sangamon street, Chicago, Ill.

Switches, Automatic

Automatic time switch, 20 and 30 amperes, 250 volts. This device consists of cast-iron case enclosing eight-day clock mechanism, arranged to operate double-pole labeled snap switch. Made by Detroit Time Switch Co., 118 Kenilworth avenue, Detroit, Mich.

Switches, Combination Cutout

Motor starting switch, 30 ampere, 250 volt, alternating current. A special 3-pole knife switch on a porcelain base with clips for cartridge enclosed fuses which, when switch is in starting position are short circuited. The device is mounted in a cast-iron cabinet with an external handle whereby the switch is operated. Made by D. & W. Fuse Co., Providence, R. I.

Washing Machine

"Capital safety first electric washer." This device is a portable motor-driven washing machine and wringer with all operating parts, except wringer rolls, enclosed. Under severe conditions of service input to motor may reach 600 watts. Motors are rated at 110 volts, and are supplied in either d.c. or a.c. types. Note.—As rating of ordinary key and pull sockets is 250 watts, 250 volts, and this rating is not to be interpreted to permit use, at any voltage, of current above 2½ amperes, device described above should not be used in connection with such sockets. Made by Capital Electric Co., 321 N. Sheldon street, Chicago, Ill.

Welding Machine

"Winfield" electric welding machine, 7-50 kva., 110, 220 or 440 volts. Types S and B. These machines are used to effect union of pieces of metal by compression, after softening by heat produced electrically. Standard when installed in manner and in location acceptable to inspection department having jurisdiction, and with suitable ground connection. Note.—Operators of these machines should be protected from flying sparks by goggles, shields or other suitable appliances. Made by Winfield Electric Welding Machine Co., Warren, Ohio.

National Electrical Contractors' Convention

As announced in our last issue, the next annual convention of the National Electrical Contractors' Association will be held at San Francisco from July 18 to 24, 1915. Convention headquarters will be in the Clift Hotel, Geary and Taylor streets. The meetings will be held in the Auditorium, Market, Hayes, and Larkin streets. The programme as made up at present is as follows:

Monday, July 19, sight-seeing.

Tuesday, July 20, 10 a. m., meeting of directors and executive committee.

Wednesday, July 21, 10 a. m., open session. Address of welcome by the president of the San Francisco Association. Address of John R. Galloway, president of the National Electrical Contractors' Association. Address of Hon. James Rolph, Jr., Mayor of San Francisco. Illustrated address John Britton, manager Pacific Gas and Electric Co. Address Charles C. Moore, director general of the Panama-Pacific International Exposition. Address W. S. Goodwin, sales manager, Pacific States Electric Co. 2.30 p. m., business session. Reception and dance at Clift Hotel, 9 p. m.

Thursday, July 22, 10 a. m., business session at Auditorium; 2 p. m., automobile ride for women and guests through Golden Gate Park and Presidio; 2.30 p. m., business session, Auditorium. Evening, N. E. C. A. night at the "Zone," Exposition grounds.

Friday, July 23, 10 a. m., final business session at Auditorium; 2.30 p. m., board of directors at Clift Hotel; 3.30 p. m., executive committee at Clift Hotel; 7 p. m., dinner, dance and vaudeville at Pompeian Court, Hale Building, 5th and Market streets.

Saturday, July 24, 9 a. m., trip by special steamer around San Francisco Bay, and through the Golden Gate, landing at exposition grounds early in the afternoon. Luncheon to be served on board.

Beginning at midnight on December 31, 1914, the exterior of the Woolworth building, New York, was illuminated for the first time. In future the tower will be illuminated every night, specially designed reflectors being employed to direct the light rays so as to bring out the Gothic design. Nitrogen filled lamps are used throughout for this purpose. Current is supplied by the plant in the basement of the building.

An entertaining and instructive lecture on architectural acoustics was delivered by Wallace Sabine at a meeting of the Franklin Institute, Philadelphia, on October 30 last. It is printed in full in the *Journal* for January, 1915, and is well worth the reading. The author gives some interesting date concerning the rate of decay of sound waves in rooms of different sizes and shapes fitted with different furnishings.

RECENT ELECTRICAL PATENTS

Controlling and Regulating Devices

1,122,657. *Controller for Electric Motors.* Harry F. Stratton, Cleveland, Ohio, assignor to The Electric Controller & Mfg. Co., Cleveland, Ohio.

1,123,251. *Electric Regulation.* John L. Creveling, New York, N. Y., assignor to Safety Car Heating & Lighting Co.

1,122,259. *Motor Control.* William M. Cummiskey, Honesdale, Pa., assignor, by mesne assignments, to Gurney Electric Elevator Co., Honesdale, Pa.

1,122,693. *Electrical Regulator.* Frank Conrad, Swissvale, Pa., assignor to Westinghouse Electric & Mfg. Co.

1,123,341. *Electrical Control System.* William N. McComb, New York, N. Y.

1,122,261. *Circuit-Controller.* William W. Dean, Chicago, Ill., assignor, by mesne assignments, to The Garford Mfg. Co., Elyria, Ohio.

1,222,488. *Circuit-Controlling Apparatus.* John W. Eskholme, Westfield, N. J., assignor, by mesne assignments, to C. & C. Electric & Mfg. Co.

1,123,373. *Electric-Circuit Controller.* Franz Ptok, Munich, Germany, assignor to Allgemeine Publikations-Gesellschaft M. B. H., Munich, Germany.

1,123,484. *Controller for Electric Circuits.* Charles H. Carter, Colon, Panama.

1,122,788. *Motor-Control System.* Jacob F. Motz, Pittsburgh, Pa.

Electric Switches and Cutouts

1,124,230. *Electric Fusible Cut-Out.* Horace Preston Liversidge, Bala, Pennsylvania, assignor to Pennsylvania Appliance Co., Philadelphia, Pa.

1,122,777. *Electric Switch.* Anker S. Lyhne, Bridgeport, Conn.

1,123,275. *Regulating Switch for Storage Batteries.* Julius H. Gugler and Martin Lindem, Milwaukee, Wis., said Lindem assignor to said Gugler.

1,122,626. *Selector-Switch.* James L. McQuarrie, Montclair, N. J., assignor to Western Electric Co., New York, N. Y.

1,133,829. *Circuit Switch.* John C. Wrasse, Mishawaka, Ind.

1,123,413. *Electric Switch.* John C. Smith, Louisville, Ky.

Generators, Motors, and Converters

1,122,491. *Alternating-Current Motor.* Valere A. Fynn, St. Louis, Mo., assignor to Wagner Electric Mfg. Co., St. Louis, Mo.

1,122,980. *Dynamo-Electric Machine.* Sören H. Mortensen, Milwaukee, Wis., assignor, by mesne assignments, to Allis-Chalmers Mfg. Co.

1,123,248. *Transformer for Use with Current-Rectifying Apparatus.* Frank Conrad, Swissvale, Pa., assignor, by mesne assignments, to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

1,123,161. *Dynamo-Electric Machine.* Ernest J. Andrews, Chicago, Ill., assignor of one-fourth to George L. Chindahl, Chicago, Ill.

1,123,971. *Distributor for Ignition Dynamos.* Howard H. Wiscon, Chicago, Ill., assignor to Stromberg Motor Devices Co., Chicago, Ill.

1,122,975. *System for Generating Electric Currents of High Frequency.* Thomas Burton Miller, Seattle, Wash., assignor of one-half to Smith Cannery Machines Co., Seattle, Wash.

1,122,534. *Generator.* Ward S. Perry, Chicago, Ill., assignor to Vesta Accumulator Co., Chicago, Ill.

1,123,319. *Dynamo-Electric Machine.* Fred R. Kunkel, Edgewood Park, Pa., assignor to Westinghouse Electric & Mfg. Co.

Heating Devices

1,123,520. *Electric Laundry-Iron.* Maximilian K. Golden, Detroit, Mich., assignor to Golden Mfg. Co., Detroit, Mich.

1,122,892. *Electric Heating Apparatus.* Dudley Farrand, Newark, N. J.

1,122,521. *Electrically-Heated Flat-Iron.* Charles P. Madsen, Chicago, Ill.

1,123,789. *Electric Heating Element.* Roderick J. M. Parke and Edward D. Brand, Toronto, Ontario, Canada.

1,123,308. *Method of Electric Welding.* Charles H. Kicklighter, Atlanta, Ga.

Lighting Devices

1,122,424. *Portable Electric Flash-Light.* Charles J. Sagebrecht, Brooklyn, N. Y., assignor to Interstate Electric Novelty Co., New York, N. Y.

1,124,218. *Incandescent Electric Lamp.* Henry Csanyi, New York, N. Y., assignor to Maxivolt Primary Battery Co., New York, N. Y.

1,123,389. *Electric Fixture.* Lindsley Schepmoes, Hasbrouck Heights, N. J., assignor to The Safety Car Heating & Lighting Co.

1,123,384. *Incandescent Electric Lamp.* John J. Rooney, New York, N. Y.

1,124,075. *Electric Pocket-Lamp.* Joseph G. Swallow, New York, N. Y.

1,122,763. *Combined Shade-Hanger and Lamp-Socket Support for Lighting Fixtures.* Walter R. Kahns, Chicago, Ill., assignor to J. H. White Mfg. Co., Brooklyn, N. Y.

1,122,425. *Portable Electric Flash-Light.* Charles J. Sagebrecht, Brooklyn, N. Y., assignor to Interstate Electric Novelty Co., New York, N. Y.

1,123,625. *Glower for Electrical Incandescent Lamps.* Orlando M. Thowless, Newark, N. J.

1,122,778. *Portable Electric Lamp.* Anker S. Lyhne, Bridgeport, Conn.

1,122,568. *Electric Incandescent Lamp.* Edward P. Beckwith, Garrison, N. Y.

Measuring and Recording Instruments

1,124,055. *Electric Water-Level Indicator.* William E. Moorefield and Andrew J. Brady, Hinton, W. Va.

1,123,855. *Electromagnetic Measuring Instrument.* William Joseph Davis, Enfield, England, assignor to Edison and Swan United Electric Light Co., London, England.

Processes and Miscellaneous Devices

1,123,074. *Coupling for Electrical Conductors.* William L. Bliss, Niagara Falls, N. Y., assignor, by mesne assignments, to Central Trust Co., New York, N. Y.

1,123,255. *Circuit-Interrrupter.* Harry P. Davis, Pittsburgh, and Christian Aalborg, Wilkinsburg, Pa., assignors to Westinghouse Electric & Mfg. Co.

1,123,283. *System of Electric Distribution and Circuit Control.* Ford W. Harris, Wilkinsburg, Pa., assignor, by mesne assignments, to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

1,123,121. *Timer and Distributor for Electrical Ignition Purposes.* James B. Frawley, Pittsfield, Mass., assignor to Pittsfield Spark Coil Co., Dalton, Mass.

1,124,192. *Electromagnetic Selecting Apparatus.* George Lee Anders, Sydenham, London, England, assignor of one-half to Walther Kottgen, Berlin, Germany.

1,123,626. *Electrical System of Distribution.* William A. Turbayne, Lancaster, N. Y., assignor to Gould Storage Battery Co.

1,122,664. *Electric Zinc-Furnace with Integral Condenser.* Charles Victor Thierry and Michel Thierry, Paris, France.

1,123,756. *Electric Accumulator.* Harry A. Kinney, Lansing, Mich.

1,123,543. *Electric-Current Collector.* Theodor Bernhard Georg Janssen, Münster, Germany.

1,122,942. *Electric System for Transmitting Angular Positions.* Paul Kaminski, Nonnendamm, near Berlin, Germany, assignor to Siemens & Halske A. G., Berlin, Germany.

1,123,282. *Circuit-Interrupter.* Ford W. Harris, Wilkinsburg, Pa., assignor to Westinghouse Electric & Mfg. Co.

1,123,558. *Electric Welding Apparatus.* Laurence S. Lachman, New York, N. Y., assignor to Universal Electric Welding Co., New York, N. Y.

WANTS—FOR SALE—AGENTS

WANTED—Salesman with electrical experience to sell cabinets and travel Central States. State salary, age, experience and explicit details if application is to be receive consideration. Address Box A-2, care of ELECTRICAL RECORD.

MANUFACTURERS of iron pipe conduit and fittings, also flexible conduit (Loom) are notified that the Southern Sales Co., 440 Randolph Bldg., Memphis, Tenn., are open for appointment as agent covering Tenn., Ark., Miss. and Ky. Correspondence is solicited.

CLASSIFIED INDEX

ACETYLENE LIGHTERS.
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ADAPTERS, Auto Lamp.

Auto Oil Lamp Converters or Brackets.
GENERAL ELECTRIC CO., Schenectady, N. Y.
HUBBELL, INC., HARVEY, Bridgeport, Conn., "Dazlite."
MANHATTAN ELEC'L SUPPLY CO., 17 Park place, New York.
METAL SPECIALTIES MFG. CO., 738 W. Monroe st., Chicago, Ill., "Gil-Bo."
MORSE, FRANK W., Boston, Mass., "Electrofier."
PLUME & ATWOOD MFG. CO., Waterbury, Conn.
ROSEN & CO., A. W., 610 Broadway, New York, N. Y.
Black Mfg. Co., Fort Wayne, Ind.
Campbell Co., A. S., Boston, "Cello."
Castle Lamp Co., Amesbury, Mass.
Chicago Electric Mfg. Co., Chicago.
Cole & Co., Henry, Boston, Mass.
Gray & Davis, Cambridge, Mass.
Horn & Brannen Mfg. Co., Phila.
Standard Elec. Novelty Co., Chicago,

ADAPTERS, Lamp.

Tungsten Adapters.
Socket Adapters & Extensions.
ARROW ELECTRI CCO., Hartford, Ct.
BENJAMIN ELECTRIC MFG. CO., 120 So. Sangamon st., Chicago, Ill. (Tungsten Adapters).
BRYANT ELEC. CO., Bridgeport, Conn. (Candelabra).
FEDERAL SIGN SYSTEM (ELEC.), Lake & Desplaines sts., Chicago, Ill.
GENERAL ELECTRIC CO., Schenectady, N. Y., "Ediswan."
HUBBELL, INC., HARVEY, Bridgeport, Conn.
WHITE MFG. CO., J. H., 111 N. 3d st., Brooklyn, N. Y. (Tungsten).
Advance Mfg. Co., Pittsburgh, Pa.
Erikson Elec. Co., L., Boston, Mass. (Tungsten Adjustable Joint).
Phila. Elec'l & Mfg. Co., Phila., Pa.
Westinghouse Lamp Co., New York.

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ADJUSTERS, Cord & Lamp.

AMERICAN VULCANIZED FIBRE CO., 500 Equitable Bldg., Wilmington, Del., "Q. & C."
ARROW ELEC. CO., Hartford, Conn., "Dow."
AUSTIN & CO., M. B., 700 Jackson blvd., Chicago, Ill., "Gem."
CONDIT ELECTRICAL MFG. CO., Boston, Mass., "Saca."
DIAMOND STATE FIBRE CO., Bridgeport, Pa.
McGILL MFG. CO., 39 Oak st., Valparaiso, Ind., "Innovate."
MATTHEWS & BRO., W. N., 3705 Forest Park blvd., St. Louis, Mo., "Easy."
MORSE, FRANK W., Boston, Mass. ("Handy" Cord and "Webster" Lamp Adjuster).
PHELPS MFG. CO., Detroit, Mich. ("Any Angle" Lamp Fixture).
TRUMBULL ELECTRIC MFG. CO., Plainville, Conn.
YOST ELEC. MFG. CO., Toledo, O. ("Electrogrip" Lamp Adjuster).
Advance Mfg. Co., Pittsburgh, Pa., "Heinz."
American Enamel Co., Providence.
Bates, H. A., Garwood, N. J., "Slip-on."
Carter & Co., J. W., Abilene, Texas, "Eclipse."
Cohn, Adolph, West Hoboken, N. J., "Rela."
C. & D. Mfg. Co., Dayton, O.
Electric Specialty Mfg. Co., Pittsburgh, Pa., "King."
Estes & Sons, E. E., New York (Wood).
Gam Mfg. Co., Lancaster, Pa.
Gund Mfg. Co., La Crosse, Wis., "Two Ball."
Hagstrom Bros. Mfg. Co., Lindsborg, Kan. (Push Button).
Harter Specialty Co., Waukegan, Ill.
Johnny Co., Greenville, O.
Lorentz, Henry E., Baltimore, Md.
Milam & Son, B. C., Frankfort, Ky.
Novelty Turning Co., Norway, Me.
Reel Adjustable Fixture Co., Chicago.
Runzel-Lenz Electric Mfg. Co., Chicago, Ill. ("R-L" Telephone Switchboard Cord Length Adjuster).
Stewart Elec. Co., F. H., Phila., Pa.

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Elec. Apparatus Co., Chicago, Ill.

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IRISH ELECTRIC CO., W. F., 35 E. 10th st., New York, "Shamrock."
OSTRANDER & CO., W. R., 22 Dey st., New York, N. Y., "Neu."
STANLEY & PATTERSON, 23 Murray st., New York, N. Y., "Patterson."
WALDMAN, JOHN J., 136 Liberty st., New York, N. Y.

ALUMINUM.

ALUMINUM CO. OF AMERICA, Pittsburgh, Pa.
Elec. Smelting & Aluminum Co., Lockport, N. Y.
So. Aluminum Co., Whitney, N. C.

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CROUSE-HINDS CO., Syracuse, N. Y., "Harpoon," "Adjustarod."
ELECTRIC OPERATIONS CO., Bush Terminal, Brooklyn, N. Y.
LANZ & SONS, M., Pittsburgh, Pa.
MATTHEWS & BRO., W. N., 3705 Forest Park blvd., St. Louis, Mo.
OSHKOSH MFG. CO., Oshkosh, Wis.
UNIVERSAL CABLE GRIP CO., Syracure, N. Y., "Red Top."
Barbed Anchor Mfg. Co., Louisville.
Barnes & Kobert Mfg. Co., Milldale, Conn., "B. & K."
Benicia Iron Works, San Francisco.
Bluffton Anchor Co., Bluffton, O.
Chance Mfg. Co., Centralia, Mo., "Never Creep."
Everstick Anchor Co., St. Louis.
Falls Elec. Co., Lima, O., "Clum."
Gund Mfg. Co., La Crosse, Wis., "D. & T."
Hallett Iron Wks., Harvey, Ill., "Hiawatha."
Johns-Manville Co., H. W., New York, N. Y., "J-M."
Klein & Sons, Mathias, Chicago, Ill.
Line Material Co., So. Milwaukee, Wis. (Guy Rods).
Miller Anchor Co., Norwalk, O., "Safety."
New England Bolt & Supply Co., Everett, Mass. (Guy Ropes).
Oliver Iron & Steel Co., Pittsburgh, Pa. (Guy Rods).
Simpson Anchor Co., Niagara Falls.
Specialty Device Co., Cincinnati, O., "Bierce."
St. Louis Malleable Casting Co., St. Louis, Mo., "O. K."
Wapak Hollow Ware Co., Wapakoneta, O.

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Cowels & Co., C., New Haven, Conn.
O'Brien Co., Joseph F., New York.

ANNUNCIATORS, Standard.

Elevator, Telephone, Hotel, Burglar Alarm.
ANSONIA ELECTRICAL CO., Ansonia, Conn.
CONNECTICUT TELEPHONE & ELECTRIC CO., Meriden, Conn.
DE VEAU TELEPHONE MFG. CO., 477 18th st., Brooklyn, N. Y., "Auth."
EDWARDS & CO., New York, "Dixie," "Etonial," "Semaphore."
HOLTZER-CABOT ELECTRIC CO., Boston, Mass.
MANHATTAN ELECTRICAL SUPPLY CO., 17 Park pl., New York.
MENOMINEE ELEC. MFG. CO., Menominee, Mich.
OSTRANDER & CO., W. R., 22 Dey st., New York.
PARTRICK & WILKINS CO., Philadelphia, Pa., "Competition."
SAMSON ELEC. CO., Canton, Mass., "Ross," "Rival," "Dandy," "Hub."
STANLEY & PATTERSON, 23 Murray st., New York, N. Y., "Premier."
WESTERN ELECTRIC CO., New York, N. Y.
Hepburn Tele. Mfg. Co., Chicago (Illuminated).
Moon Mfg. Co., Chicago, Ill., "Knapp," "Eclipse," "Acme."

ANTI-HUMS.

BUNNELL & CO., J. H., 32 Park pl., New York.
MANHATTAN ELEC'L SUPPLY CO., 17 Park pl., New York.
Harvard Elec. Co., Chicago, Ill.

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Ohio Cross Arms Co., Columbus, O.

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ARMS, CROSS, (Wood).

BARNES-LINDSLEY MFG. CO., Portland, Ore.
BERTHOLD & JENNINGS LUMBER CO., Wright Bldg., St. Louis, Mo.
BISSELL CO., F., Toledo, O.
FOWLER & CO., J. H., Fisher Bldg., Chicago, Ill.
LINDSAY BROS. CO., Spokane, Wash.
WESTERN LUMBER & POLE CO., Electric Bldg., Denver, Colo.
Absher Co., W. M., North Wilkesboro, N. C.
Am. Creosote Wks., New Orleans, La.
Am. Cross Arm Co., Chicago, Ill.
Atlantic Creosoting & Wood Preserving Co., Norfolk, W. Va.
Berlin Mills Co., Portland, Me. (Kyanized).
Boggs & McNeill Co., Albany, Ga.
Central Lumber Co., Chattanooga.
Cohn & Bock, Princess Anne, Md.
Cranston Lumber Co., John A., Wilmington, Del.
Doty (Wash.) Lumber & Shingle Co.
Elkin Machinery Co., Elkin, N. C.
Ferguson Lbr. Co., Little Rock, Ark.
Georgia Tie & Lumber Co., N. Y.
Gulfport (Miss.) Creosoting Co.
Hamilton & Strong, Colville, Wash.
International Creosoting & Cons. Co., Galveston, Tex.
Kirby & Hawkins, Phila., Pa.
Lacey Lumber Co., Carrier, Miss.
Lord & Co., L. H., Peoria, Ill.
Louisiana Red Cypress Co., New Orleans, La.
Megahan & Co., Westerville, O.
Morse Lumber Co., Los Angeles.
Noblett Co., E. J., Chattanooga.
Norfolk Creosoting Co., Norfolk, Va.
Roper Lumber Co., Norfolk, Va.
Seattle (Wash.) Timber Supply Co.
Southern Evch. Co., Maxten, N. C.
South. Pine Mfg. Co., Paducah, Ky.
Swayne R. B., San Francisco, Cal.
Tacoma-Seattle Timber Co., Tacoma.
Texas Arm & Pin Co., Beaumont.
Vuncannon, J. B., West End, N. C.
Wade & Co., Shippensburg, Pa.
Williams Cypress Co., F. B., Patterson, La.
Wykoff Pipe & Creosoting Co., N. Y.
Zeones Lumber Co., Pe Ell, Wash.

ARMS, Mast.

BRADY ELECTRIC MFG. CO., New Britain, Conn.
CUTTER CO., GEO., 411 Notre Dame, South Bend, Ind.
ELECTRIC RAILWAY EQUIPMENT CO., Cincinnati, O.
MORRIS, ELMER P., 136 Liberty st., New York.
Buffalo Specialty Co., Buffalo, N. Y.
Fletcher Mfg. Co., Dayton, O.
Line Material Co., So. Milwaukee, Wis.
Lundin Elec. & Mach. Co., Boston, Mass., "Philbrick."
Phila. (Pa.) Elec'l Mfg. Co.
Russell Elec. Mfg. Co., Providence.

ARRESTERS, Lightning.

Light and Power.
GENERAL ELECTRIC CO., Schenectady, N. Y.
WESTINGHOUSE ELEC. & MFG. CO., East Pittsburgh, Pa., "Wurtz."
WOOLLEY, W. DOUGLAS, 30 N. Michigan ave., Chicago, Ill., "C-C Non-Gap."
Anderson Mfg. Co., Albert & J. M., Boston, Mass., "Ajax."
Arrow Conductor & Mfg. Co., Chicago.
Brach Supply Co., L. S., New York.
Delta-Star Elec. Co., Chicago, Ill.
Elec. Service Supplies Co., Phila.
Gifford El. Mfg. Co., Traverse City, Mich.
Lord Mfg. Co., Brooklyn, N. Y., "Shaw," "Multi-Vapo-Gap," "Abacot."
Oleson Spring Co., Toledo. O.

ARRESTERS, Lightning.

Telephone and Telegraph.
BUNNELL & CO., J. H., 32 Park pl., New York, N. Y., "Union," "Triangle."
CHICAGO FUSE MFG. CO., Chicago.
D. & W. FUSE CO., Providence, R. I.
MANHATTAN ELEC'L SUPPLY CO., 17 Park pl., New York, "Union."
RELIABLE ELEC. CO., Chicago, Ill.
Am. Elec. Co., Chicago, Ill.
Automatic Fusible Lightning Arrester Co., Colorado Springs, Colo.
Brach Supply Co., L. S., New York.
Butler Elec. Co., Easton, Pa.
Chance Mfg. Co., Centralia, Mo., "Sky-Rocket."
Cook, F. B., Chicago, Ill.
Cox Arrester Co., C. E., Eaton, Ohio.
Cracraft, Leich Elec. Co., Genoa, Ill. (Self-Cleaning Shunt Arresters).
Ericsson Mfg. Co., Buffalo, N. Y.
Foote, Pierson & Co., New York, "Argus."
Garford Mfg. Co., Elyria, O.
Gifford Elec. Mfg. Co., Traverse City, Mich., "Paradox."
Harvard Elec. Co., Chicago, Ill.
Howard, A. G., Holdredge, Neb.
Insulator Arrester Co., Duluth, Minn.
Kellogg Switchboard & Supply Co., Chicago, Ill.
Minneapolis (Minn.) El. Co., "Chapman."
National Elec. Specialty Co., Toledo, O., "Vac-M."
P. & M. Co., Chicago, Ill.
Royal Elec. Co., Sidney, O., "Hypostat."
Schinn, W. C., Lincoln, Neb.
Stromberg-Carlson Tele. Mfg. Co., Rochester, N. Y.

ARTIFICIAL (PHANTOM) LOAD INSTRUMENTS. — See Instruments, Testing and Measuring.

ASBESTOS.

Sheet, Paper, Mill Board, Lumber.
Acme Asbestos Covering & Supply Co., Chicago.
Carey Mfg. Co., Phillip, Cincinnati.
Ehret Magnesia Mfg. Co., Phila.
Franklin Mfg. Co., Franklin, Pa.
General Asbestos & Rubber Co., Charleston, S. C.
Johns-Manville Co., H. W., N. Y.
Keasbey & Mattison Co., Ambler, Pa.
New Jersey Asbestos Co., Camden, N. J., "Gladiator."
N. Y. Asbestos Mfg. Co., New York.
Norristown Magnesia & Asbestos Co., Norristown, Pa.
Sall Mountain Asbestos Mfg. Co., Chicago.
Watson Co., H. F., Erie, Pa.

ASBESTOS, WIRE.
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ATTACHMENTS.

Gas Fixture.
AMERICAN PIN CO., Waterbury, Conn.
BRYANT ELEC. CO., Bridgeport, Conn.
MANHATTAN ELEC'L SUPPLY CO., 17 Park pl., New York, N. Y.
PLUME & ATWOOD MFG. CO., Waterbury, Conn.
TRUMBULL ELEC. MFG. CO., Plainville, Conn.
WHITE MFG. CO., J. H., 111 N 3d st., Brooklyn, N. Y.
Am. Brass & Copper Co., New York.
Spencer's Sons, I. S., Guilford, Conn.
Steele & Johnson Mfg. Co., Waterbury, Conn.
Walsh Mfg. Co., Owen, New York.

ATTACHMENTS, Socket.

Socket Pulls.
Chain Adjusters.
Chain Extensions.
HUBBELL, INC., HARVEY, Bridgeport, Conn., "Ham," "Harding," "Economy."
PEERLESS LIGHT CO., Peerless Bldg., Chicago, Ill. ("Flexo" Socket Pull).
PHELPS MFG. CO., Detroit, Mich.
RITTENHOUSE CO., A. E., Honeoye Falls, N. Y., "Easylite."
Barry Mfg. Co., Boston, Mass.
Premier Novelty Co., Chicago, Ill. ("Just Pull" Socket Pull).

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AUTOMOBILES, Electric.

American Elec. Car Co., Saginaw, Mich., "Argo," "Broc," "Boland-Grannis."
Anderson Elec. Car Co., Detroit, Mich., "Detroit Electric."
Atlantic Vehicle Co., Newark, N. J.
Atlas Car & Mfg. Co., Cleveland, O. (Trucks).
Automatic Transportation Co., Buffalo, N. Y. (Baggage Trucks).
Bailey & Co., Amesbury, Mass.
Baker Motor Vehicle Co., Cleveland.
Beaver Motor Truck Co., Portland, Ore.
Buffalo Elec. Vehicle Co., Buffalo.
Capitol Truck Co., Denver, Colo.
Century Elec. Car Co., Detroit, Mich.
Champion Wagon Co., Oswego, N. Y. (Commercial Vehicles).
Chase Motor Truck Co., Syracuse, N. Y. (Repair Wagons).
Chicago El. Motor Car Co., Chicago.
Cleveland Galion Motor Truck Co., Cleveland, O.
Columbian Elec. Vehicle Co., Detroit.
Columbus Buggy Co., Columbus, O.
Commercial Truck Co. of Am., Phila.
Couple-Gear Co., Grand Rapids, Mich. (Commercial Vehicles).
Dayton Elec. Car Co., Dayton, O.
Elec. Vehicle Ass'n of America, N. Y.
Electriquette Mfg. Co., Los Angeles, Cal., "Osborn" Chair.
Empire El. Veh. Co., Oswego, N. Y.
Field Elec. Bus Co., New York.
Fritchie Auto & Bat. Co., Denver.
Galion (O.) Dynamic Motor Truck Co. (Trucks).
Gen. Motors Truck Co., Pontiac, Mich.
General Vehicle Co., Long Island City, N. Y. (Commercial Vehicles).

Electrical Record

Established 1892

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In view of a letter recently sent out by the managing director of the Underwriters' Laboratories we think it necessary to caution manufacturers of new electrical fittings about the conditions attending the formal approval of such fittings. It seems that the unqualified recommendation of the engineer in charge of the test on a fitting, buttressed by the approval of the managing director, must not be accepted as the final word. These opinions, though based on the knowledge, experience, and judgment of the men in responsible charge of details, are mere opinions still. Final authority rests with the council, and the council's decisions do not become law until the formal approval cards are issued and received.

The old system of moving cotton in compresses and terminals by means of hand trucks and trolley conveyor systems is now giving way to the more highly efficient and more economical means of hauling by electric industrial trucks. At Galveston, the largest cotton concentration point and spot market in the world, the progressive warehousemen have recently installed electric industrial trucks to move cotton to greater advantage than has ever been done before. The general use of electric industrial trucks as a source of revenue should appeal to all central station operators.

A well known manufacturer of bell-ringing transformers says in a letter recently received: "The new Record is a fine issue, and anyone who misses a copy should quit the electrical business and take up farming, where things move slower."

Following the wake of the numerous electric hand lanterns that have come into the market within the last two or three months, comes tidings of the marketing of many new electric pocket flashlights. The newest form of these handy devices, several of which are shown elsewhere in this issue, take the form of fountain pens, with a spring clip that performs the dual rôle of electric switch and pocket holdfast. The greatest activity in the electrical industry at present is that taking place in small lighting units.

The effect of the war on the export of electrical goods from the United States to Britain, and Germany to Britain, is shown strikingly in a chart published in a late issue of the British *Electrical Review*. In April, 1914, Britain was buying electrical goods from Germany at the rate of a million dollars a month. At that time our exports to Britain amounted to about one-third of this sum. Between the beginning of the war, early in August, and the first of September, the imports from Germany into Britain dropped abruptly from about one million dollars per month to nothing. On the first of September we were sending goods to Britain at the rate of about two hundred thousand dollars a month. At this point the line showing our exports to Britain rises almost as abruptly as the one drops that shows the falling off of exports from Germany to Britain. We are taking Germany's place in the British market, and are now exporting every month to Britain electrical goods valued at about eight hundred thousand dollars.

The latest comer in the electric lighting field is the 100-watt nitrogen filled mazda lamp. It operates at an efficiency of about three-quarters of a watt per candle-power, and gives an intense white light. The new method of supporting the filament compels this lamp to be burned with the tip downward, though it is not improbable that within a short time this lamp, like the older forms of mazda lamps, can be burned in any position. No changes in sockets and reflectors will be required, the old ones being adaptable for this purpose. The extra heat developed by these lamps will, however, have to be taken account of in many of the other lamp fittings.

A message going across the continent on the new transcontinental line, travels, not at the rate of 1090 feet per second, which is the old stage-coach speed of sound, but at 56,000 miles per second. If it were possible for sound to carry that far, a hello uttered in New York and traveling through the air without the aid of wires and electricity, would not reach San Francisco until four hours later. The telephone not only transmits speech, but transmits it thousands of times faster than its own natural speed. Thus practical electrical operation bids fair to outstrip both imagination and magic.

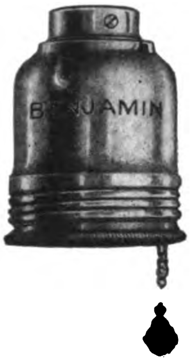
Following the success on one railroad with wireless apparatus on moving trains, several other large trunk line roads are making experiments with the intention of using this service for traffic purposes. By means of wireless, dispatchers can communicate direct with the train and messages be sent back and forth for any purpose whatsoever. At the present time this service is being used effectively between a fixed station and a train going at the rate of 40 miles an hour at a distance of 53 miles from that point. There are many uses for the wireless telegraph in railroad train operation. It enables the despatchers to communicate direct to the train, and train orders can be transmitted as accurately as by telegraph or telephone.

NEW PRODUCTS

THIS DEPARTMENT IS DEVOTED EXCLUSIVELY TO NEW GOODS, AND IS A COMPLETE MONTHLY RECORD OF PROGRESS

Benjamin Weatherproof Pull Socket

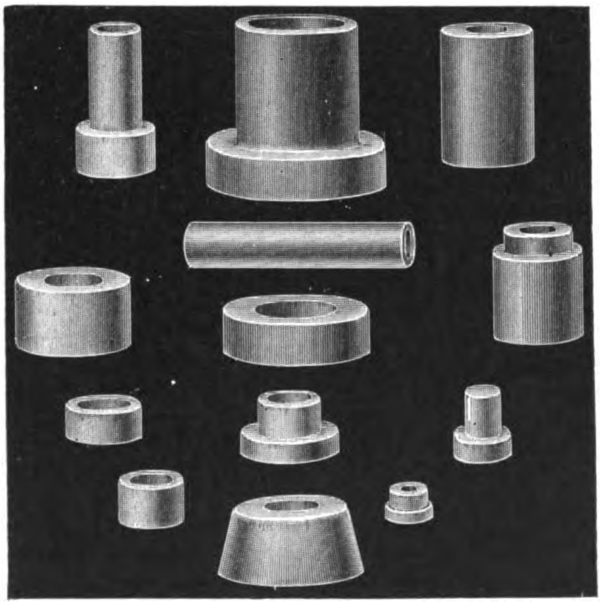
A new outdoor type of pull chain socket has just been put on the market by the Benjamin Electric Mfg. Co., 120-28 South Sangamon street, Chicago. A novel feature of this socket is the placing of the chain within the outer shell, so that when the shade or reflector is atached the chain drops perpendicularly inside the shade or reflector and does not rub against it. The chain is fully insulated from the receptacle. All kinds of reflectors, globes, and shades can be attached to the lower part of the socket by means of the threaded rings shown in the cut. This socket is finished in brass, copper, or aluminum. The Underwriters have approved it.



Benco pull socket. Benjamin Electric Mfg. Co., 120-28 South Sangamon street, Chicago, Ill.

Crescent Lava Insulators

The use of lava or steatite for insulators, bushings, and tubes is not new, but such fittings cut from the stone and marketed at a price to correspond to synthetic insulators is a novelty. For very large pieces, or purposes where sharp lines, straight shoulders, and careful execution are not essential, the composition materials will suffice, but crescent lava insulators are said to be essential where accuracy, precision, close fitting, and unexcelled heat resisting qualities are required. The manufacturers employ for this purpose a mineral, silicate of magnesia, which they place in the original solid state on turning lathes. Treated in this way these fittings attain precision and uniformity. There is said to be no limit to the variety of models and shapes produced by this process. They are made by M. Kirchberger & Co., Inc., 378 Second avenue, New York.



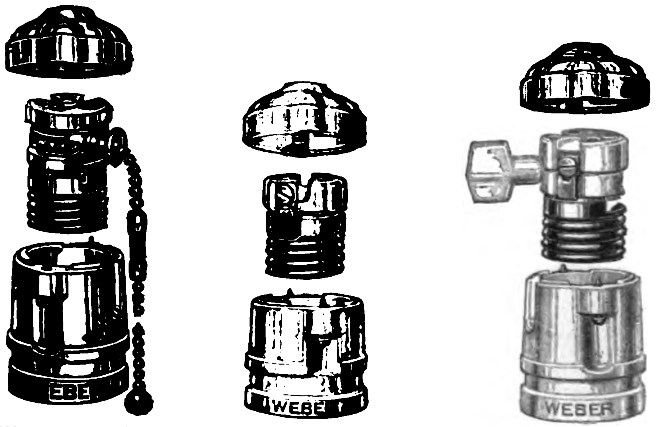
Cut lava insulators and bushings. M. Kirchberger & Co., Inc., 378 Second avenue, New York.

Yost Socket

A new line of high grade sockets for all purposes is now being manufactured by The Yost Electric Mfg. Co., Toledo, Ohio. The features are a long, quick break between contact points to reduce arcing, and plenty of room in which to tie a knot in the cord. They are made in various types—key, keyless, both ⅛ inch and ⅜ inch, and wall sockets with either open or closed base.

Weber Porcelain Sockets

The Weber Electric Co. announces that it is about to market its new line of porcelain sockets, in which the interior fittings, shells, caps, and bases are separate, as in brass-shell sockets. This construction enables the sockets to be wired in exactly the same manner as are brass-shell sockets. The shell is fastened to cap or base by two screws on the outside, a better and more secure method of fastening than one or two screws on the inside.



Weber porcelain sockets. Henry D. Sears. 181 State street, Boston, Mass.

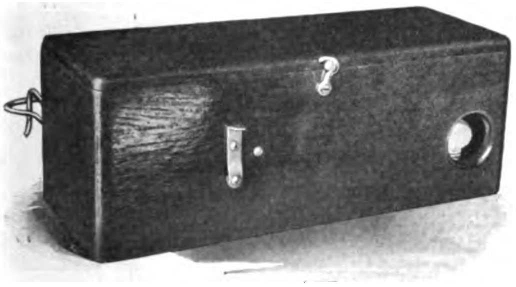
In the pull sockets the same chain guides are used as in the Weber brass-shell sockets. The action of the chain through these is much easier and smoother than when coming through a hole in the porcelain. It is not necessary to disconnect the chain in assembling.

The line is interchangeable and complete, consisting of three interiors, two shells, two pendent caps, seven fixture caps, and sixteen wall bases, from which seventy-five different combinations can be made. All shells fit all caps and bases and the same shells are used in key and pull sockets.

Weber porcelain sockets may be obtained from Henry D. Sears, general sales agent, 131 State street, Boston, Mass.

Electric Rain Alarm

The accompanying cut shows a novel electrically operated device which has recently been brought out by the Electric Devices & Mfg. Co., 466 Peoples Gas Building, Chicago. This contrivance is put on the window sill at night when the window is left open for ventilating purposes. It consists of a box containing a battery, a buzzer, a small electric light, and a switching arrangement that holds what the makers call a "Raino-disc." The falling rain, which is likely at any time to drive into the room and damage furnishings, drops on this disc, switches on the current, and throws both light and buzzer into circuit. The buzzer awakens the sleeper, and the light shows which window needs attention.

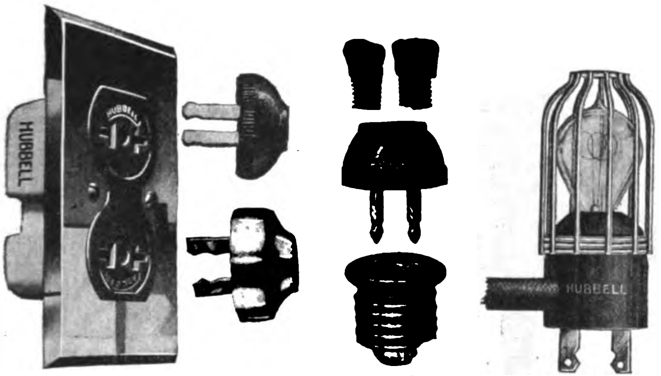


Rain alarm. Electric Devices and Mfg. Co., 466 Peoples Gas Building, Chicago, Ill.

The latest form of this device has the raino-disc on top of the box instead of at the back. This new arrangement arouses the sleeper only when the rain is actually driving into the room, thus avoiding false alarms.

Hubbell Duplex Flush Receptacles, Signal Attachment Plug, and Small Separable Attachment Plug

All three of these devices have recently been put on the market by Harvey Hubbell, Inc., Bridgeport, Conn. The duplex flush receptacle will take any one of an assortment of seventeen different styles of Hubbell plug caps, fitted with either of the knife blade contacts shown detached in the accompanying cut.



Separable attachment plug

Duplex flush receptacle. Signal attachment plug.

Three new fittings made by Harvey Hubbell, Inc., Bridgeport, Conn.

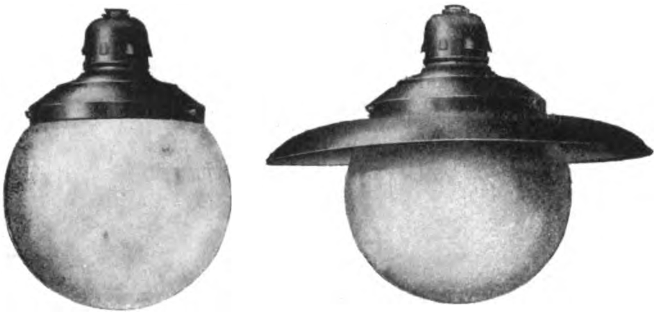
The chief feature of the duplex receptacle is that it furnishes an additional outlet without the usual expense of the two-gang receptacle. One set of binding screws serves for both outlets. This receptacle is rated at 6 amperes, 250 volts per outlet. It can be had in any finish desired.

The signal attachment plug is suitable for use with all manner of electrically heated devices of 10 ampere capacity or less. It furnishes a cheap means of telling whether the current is on or off. Each plug is supplied with a small electro-welded lamp guard to protect the lamp from breakage. All brass parts are nickle-plated, and the body is composed of heat-proof composition. It comes with either standard or small type knife blade contacts.

The small separable attachment plug has a cap provided with a composition crown top strain relief bushing, which, when threaded into the top of the cap, serves as a handle for withdrawing from the receptacle. The split bushing grips the cord and relieves the binding screws from strain, making unnecessary the tying of a knot.

Wheeler Multiple Mazda Fixtures

A new line of fixtures for Type C gas filled lamps is now being offered to the trade by the Wheeler Reflector Co., 156 Pearl street, Boston, Mass. These fixtures are designed especially for use in store front and store entrance lighting. They are of porcelain enameled steel, well ventilated, and finished with royal blue outside.



Multiple mazda fixture. Wheeler Reflector Co., 156 Pearl street, Boston, Mass.

The steel form is so designed that the enameled white interior serves as a reflector without interfering with the free circulation of air for ventilating purposes. Copper over-collars are furnished to slip over the lip of the globe. The set screws in the holder bear against this copper collar and grip the globe firmly without putting pressure on the glass. This feature prevents breakage due to pressure when the glass expands.

By the use of one body with a reflector and another without a reflector, both equipped with fittings to take globes with 8-inch lips, and with either medium screw base or mogul base sockets, a wide range of fixtures can be assembled. These fixtures with standard 8 by 10 or 8 by 12 globes can be made to serve as containers for Type C lamps ranging from 200 to 1,000 watts.

100-Watt Nitrogen Filled Mazda Lamp

The newest comer on the market in the shape of a high efficiency mazda lamp is the 100-watt mazda Type C unit just brought out by the National Lamp Works of General Electric Co., Nela Park, Cleveland, Ohio. This lamp has the lowest wattage of the multiple mazda Type C group, which includes the 200, 300, 400, 500, 750, and 1,000-watt sizes. Like the others in this group, it is a non-vacuum or nitrogen filled lamp with a concentrated form of filament. It operates at an efficiency of 0.8-watts per candle-power, and gives a much whiter light than the older Type B mazda lamps. It is especially adapted for illuminating store windows.

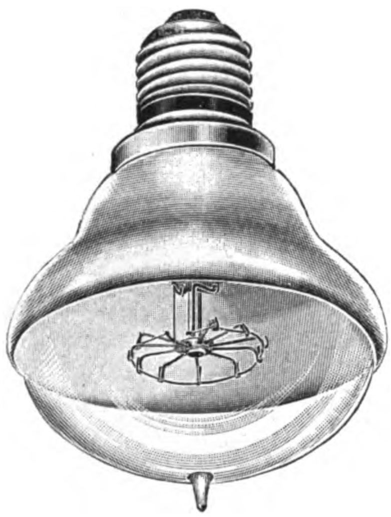
The candle-power of this lamp is 125 in a horizontal direction as against 105 in the case of the older

Type B mazda lamp. This is a gain of 19 per cent. in horizontal candle-power.

No changes will be made in the present reflector equipment, and the sockets and reflectors used with the old lamps can also be used with this one. The light center occupies approximately the same position relative to the reflector as it did in the older type of lamp. The makers assert that this lamp must be burned with the tip downward, this position being made necessary by the new method of supporting the filament.

Sunlite Reflector Lamp

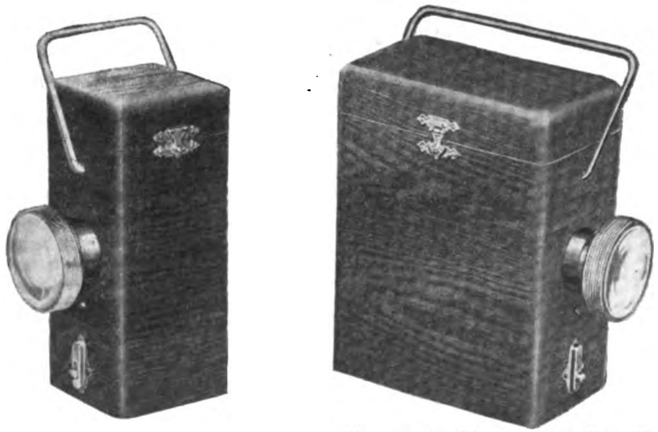
A special form of tungsten lamp for throwing light downwards is shown in the accompanying cut. It is made by Duhrssen & Pfaltz, Inc., 19 East 17th street, New York. It is said to form an ideal illuminant for factories, machine shops, printing shops, and other places where light rays have to be locally concentrated. This lamp is made in capacities ranging from 25 to 300 watts for either 110 or 220 volt circuits. It is furnished either with or without a reflector.



Simlite reflector lamp. Duhrssen & Pfaltz, Inc., 19 East 17th street, New York.

Daylite Lantern

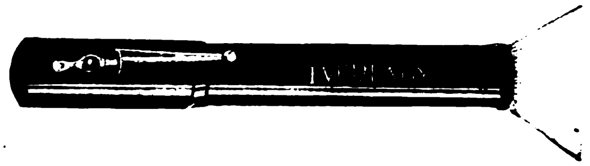
The accompanying cuts show two types of the "Daylite" lantern now being offered to the trade by the Illuminating Electric Mfg. Co., 236 South 3rd street, Philadelphia. The larger lantern will hold two standard dry batteries and will burn over 100 hours for 50 cents. The smaller lantern holds one standard battery and will burn for over 50 hours for 25 cents. Both types will throw the light rays about 100 feet. They are finished in polished oak with nickel plated fittings, silver-plated reflector, and an extra thick bull's-eye lens.



One and two-battery hand lanterns. Illuminating Electric Mfg. Co., 236 South 3d street, Philadelphia, Pa.

Eveready Fountain Pen Light

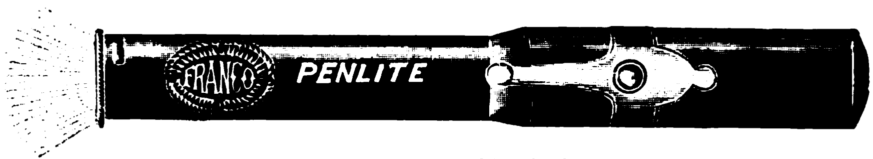
A flashlight that looks exactly like a fountain pen has just been announced by the American Ever Ready Works, 308 Hudson street, New York. The light can be either flashed or burned continuously as desired, and laid down while burning, so that both hands are free to work. A "tungsten battery" supplies the energy for this light.



This device is 5¾ inches long, ¾-inch in diameter, and weighs only 1½ ounce. It has a clip so that it can be securely carried in the vest pocket without inconvenience.

Franco Penlite

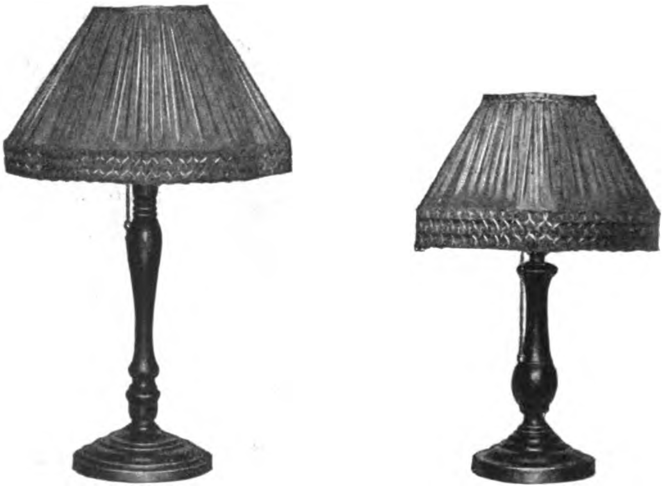
The Franco Penlite shown below, has the same shape as a fountain pen, but is slightly larger in size. It is made in either black, nickel-plated, or oxidized finish, with a clip for fastening in the pocket. It is equipped with a France Radio lens bulb, and holds an efficient dry battery about ⅜ inch in diameter and 4 inches long. It is made by the Interstate Electric Novelty Co., 29-31 Park place, New York.



Franco Penlite. Interstate Electric Novelty Co., 29-31 Park place, New York.

Western Electric Silk Portables

A line of silk shade portables has just been put on the market by the Western Electric Co., 463 West street, New York. Two of these portables are shown in the annexed illustrations. The line includes a large variety of colors and shapes, all of first quality silk.



Silk shade portables. Western Electric Co., 463 West street, New York.

General Electric Miners' Electric Lamp

The General Electric Co., Schenectady, N. Y., is offering a new miners' electric lamp that is said to be entirely safe to use in gaseous mines. The outfit consists essentially of a lead plate battery, carried on the belt; a ¾ c.p. mazda lamp with a suitable reflector held in a steel shell, carried on the cap; and a cable connecting the battery and the lamp.

Miner's electric lamp. General Electric Co., Schenectady, N. Y.

By adequate insulation of the entire circuit, placing all terminals and contacts inside of locked and sealed steel cases, and providing automatic means for extinguishing instantly the glow of the filament, should breakage of the lamp bulb expose it to the air, this lamp offers no element of danger. The outfit complete weighs but 3¾ lb., of which 3½ lb. are carried on the belt and 4 oz. on the cap. The battery is rated at 7.2 ampere-hours. Normally it will light the lamp 12 hours per charge, and it can be relied on to furnish light at least 10¾ hours per charge at the end of one year's service. The ¾ c.p. mazda lamp operates at 1.9 volts and the reflector distributes the light evenly through a solid angle of about 130 deg.

The battery is non-spilling and the terminals are not subject to acid corrosion. The case is of medium hard rubber. Exide plates are used. The battery box measures 6¼ in. high by 5 in. wide by 2 in. thick over all. It is made of drawn steel, electrically welded, including the two side straps for the miner's belt.

Phelps "Nu" Air Heater

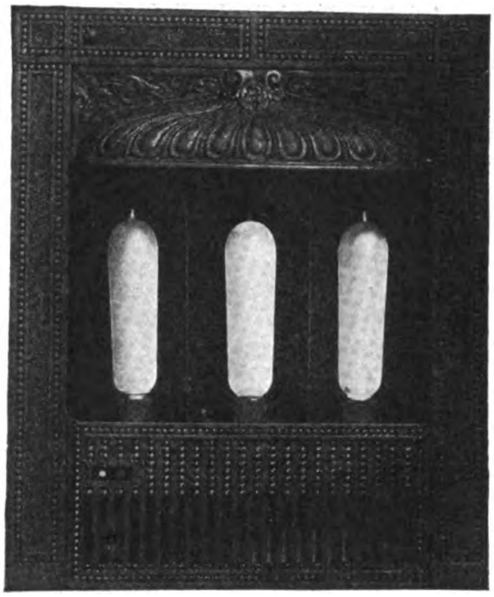
A light, compact, and efficient air heater called the "Nu" has just been placed on the market by the Phelps Mfg. Co., Detroit, Mich.

"Nu" air heater. Phelps Mfg. Co., Detroit, Mich.

It is constructed of sheet metal, and is equipped with the standard Phelps patent heating element. The element is open, and is protected by a metal screen so as to eliminate danger of igniting anything which might come into contact with it. A specially designed copper reflector conveys the circulation of the air from the lower part and throws it out in direct contact with the element itself.

Westinghouse Mantel Type Radiators

A complete line of luminous radiators for use in the mantel place is being marketed by the Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa. These radiators range in size from 15½ by 18 inches to 30 by 30 inches, several designs being available in each size.


Three-unit mantel electric radiator. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

The radiators use from two to four luminous heating units each, each heating unit requiring 250 watts.

The radiators are adapted for intermittent service, and are particularly useful for removing the chill before or after the regular heating system is in use.

Each radiator consists of an ornamental front with polished copper reflector, and two, three, or four heating units which are readily removable. The fireplace radiators are furnished in polished brass, antique brass, oxidized copper, or practically any electroplating finish desired. Bathroom radiators are finished only in polished nickel.

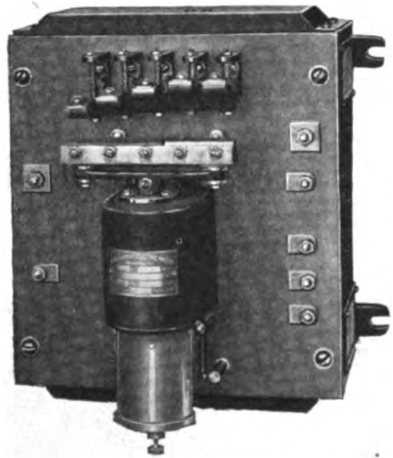
Dash Pot Automatic Controller

The Industrial Controller Co., formerly the Independent Electric Mfg. Co., Milwaukee, Wis., has recently brought out a new line of automatic starters for direct current motors, one of which is shown in the accompanying illustration.

The contact bar, solenoid core, and dash-pot piston are all rigidly fastened together, forming a single movable part having a simple straight line motion in a vertical direction. The contact bar is moved upward by the solenoid to start the motor and when released drops quickly by gravity to the "off" position.

Both finger tips and contact bar are renewable, and are so designed that in emergencies new parts could be readily made by an ordinary mechanic from commercial sizes of copper and carbon.

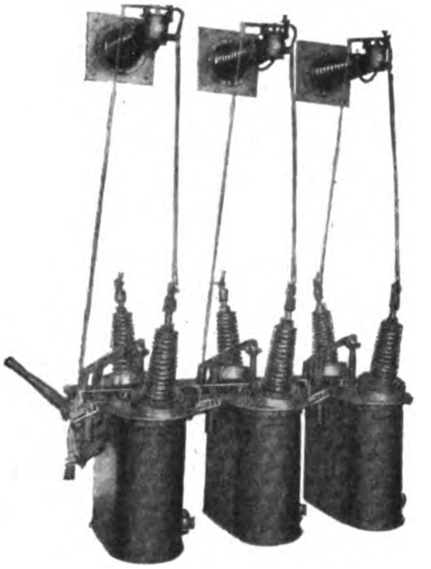
The dash-pot is of the vacuum type with an adjustable air inlet valve which controls the time of acceleration. A portion of the vacuum chamber is provided with a by-pass, thus permitting the contact bar to jump quickly to the first contact and eliminating the arcing that would otherwise occur. The acceleration can be varied over a wide range and the adjustments made if desired while the starter is in operation.


Dash pot automatic controller. Industrial Controller Co., Milwaukee, Wis.

The starters are designated as Type "E," and are suitable for a great variety of applications.

General Electric Series Trip for High Voltage Oil Switches

The General Electric Co., Schenectady, N. Y., announces the marketing of an improved type of high voltage series tripping device. The new features are: accessibility of the working parts for inspection; cleaning or adjustment while in service without danger; calibration at the oil switch itself, and not at the insulator supporting the series tripping solenoid; and the use of a new type of solenoid, which consists of but a few parts that take care of themselves after the trip is installed.


Type F Form K-21 triple-pole single-throw 45,000-volt oil switch with triple-pole time-limit series trip. General Electric Co., Schenectady, N. Y.

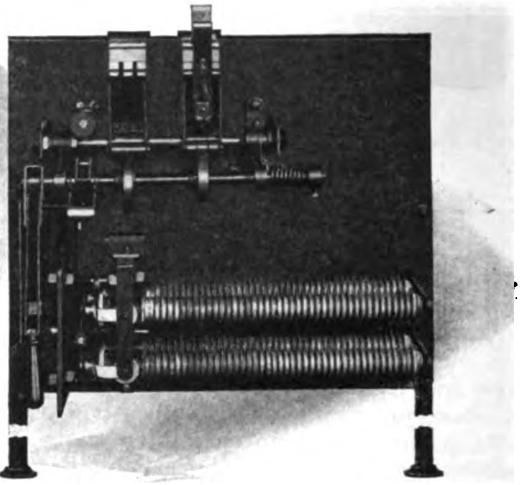
The solenoid plunger is connected to the tripping mechanism of the oil switch by a wooden rod. Change in current tripping values is accomplished by a movable weight located near to the operating mechanism of the switch at a considerable distance from the high pressure current.

This type of series trip is furnished for instantaneous or inverse time limit operation. Time delay is obtained by means of a dash pot mounted on the tripping mechanism at the switch.

Allen-Bradley Starting Rheostat for Direct Current Motors of Large Capacity

In the accompanying illustration is shown the new graphite compression type resistance starter for motors of 150 h.p. and over, recently put on the market by the Allen-Bradley Co., 495 Clinton street, Milwaukee, Wis. This device incorporates the graphite compression type resistance, by means of which smooth and even acceleration of the motor is obtained without flashing and burning.

The resistance units embodied in this starter cannot break, do not burn out, are not affected by moisture or corrosive fumes—in fact, are practically indestructible. All operating parts are in full view and readily accessible. There is nothing on the back of the starter but the necessary busbars and line and motor connections.

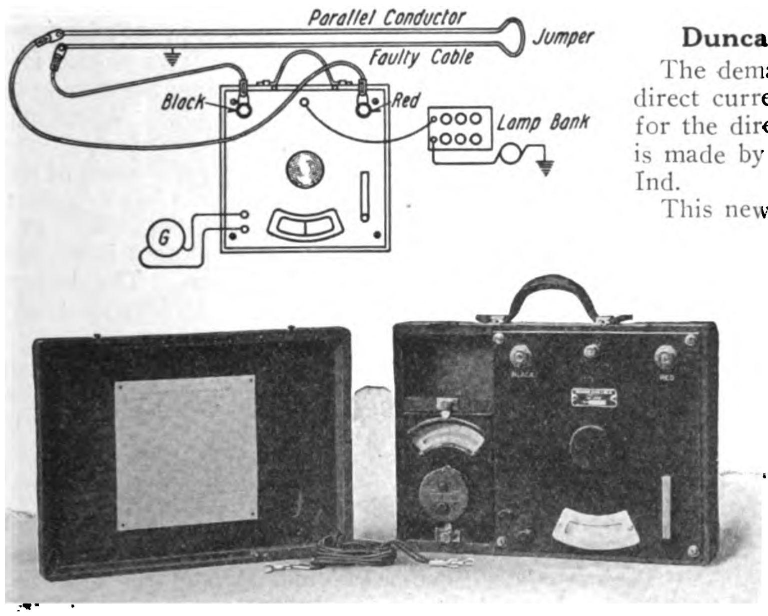

Type J starting rheostat for direct current motors from 150-300 h.p. Allen-Bradley Co., 495 Clinton street, Milwaukee, Wis.

An automatic no-voltage release is furnished on the standard starters with its operating magnet ordinarily connected in series with the shunt motor field. The starter can be equipped with an overload release mechanism which is positive in operation.

Westinghouse Portable Fault Localizer

A portable fault localizer, for quickly locating a ground on a power cable is now being marketed by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. The position of a ground is read directly off the dial in terms of per cent. of length of defective cable. It is an application of the Wheatstone bridge with all the necessary apparatus contained in one portable case wired for connection to the circuit to be tested. Its use assumes that the cable is grounded at only one point and that a parallel conductor of the same length and resistance as the faulty cable is available.

After proper connections are made, a dial on the instrument is revolved by means of a knob in the middle of the localizer until the galvanometer shows no deflection when the key is closed. The reading of the meter then gives the percentage of length of the feeder from the point where the test is being made to the location of the ground, assuming the total length of the feeder to be 100 per cent.; the red scale indicating that the ground is on the conductor connected to the binding post marked red, and the black scale indicating to the binding post marked black. Direct current only is used in these tests.



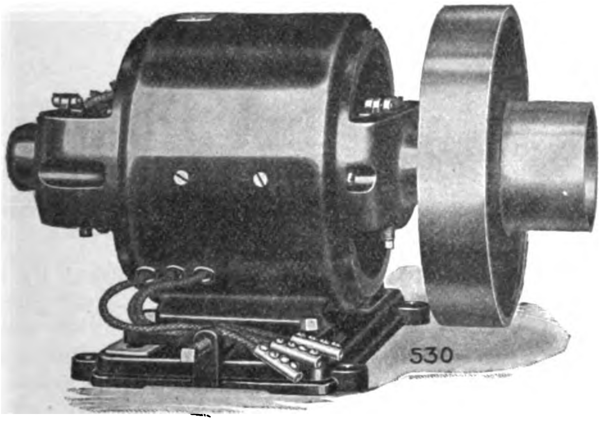
Portable fault localizer. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

The fault localizer consists of a polished wooden case which contains all the parts necessary for the test except the source of direct-current supply and the leads to the cables. Two styles are furnished, one containing a galvanometer and the other for use with a separate galvanometer.

Robbins & Myers Steel Frame Direct Current Generator

The illustration shows a new generator recently introduced by The Robbins & Myers Co., Springfield, O. This generator has a cast steel frame and is made in capacities ranging from .24 to 1.5 kw.

These generators are furnished in low voltages for charging storage batteries as well as in the higher voltages, and are particularly suitable for farm lighting plant and similar services. They can be supplied with fly wheel pulleys as shown in the illustration, for gasoline engine drive.



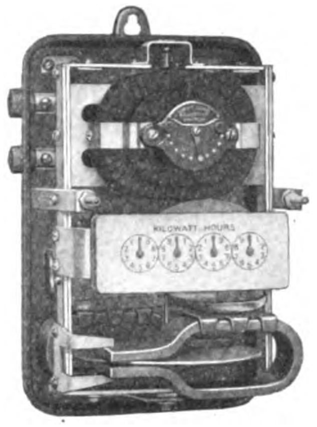
Steel frame direct current generator. The Robbins & Myers Co., Springfield, Ohio.

The leads are brought out through holes in the frame which are bushed with a heat resisting insulating material. Sliding bases are supplied with adjustment screws for adjusting the belt tension.

Duncan Direct Current Watthour Meter

The demand on the part of lighting plants for small direct current meters with ample torque is responsible for the direct current watthour meter shown below. It is made by the Duncan Electric Mfg. Co., La Fayette Ind.

This new meter is known as Model E½ and is perceptibly smaller than the Model E1, which it has superseded in the smaller capacities—the sizes being 2½, 5, 7½, and 10 amperes, for 110 and 220 volts.



Direct current watthour meter. Duncan Electric Mfg. Co., La Fayette, Ind.

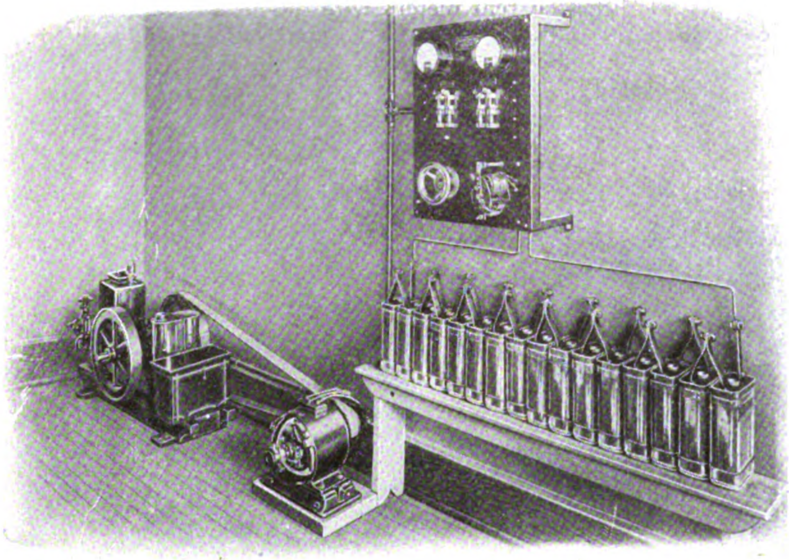
The compensating coil and switch are made in one unit and are not separated as in the other models, which feature greatly facilitates repairs. The meter conforms to the requirements of the Board of Underwriters. In this model the registering train is moved down to the center of the meter, thereby allowing free access to the commutator and brushes. The meter complete weighs 10½ lb. as against 14 lb. in similar capacities of the Model E1. The ratio of torque to weight remains the same as in the larger types, for which reason greater accuracy has been secured.

India Collapsible Electrical Lamps

These lamps are now being offered to the trade in a large variety of silk and cretonne designs by Rose Brothers & Co., Lancaster, Pa. They are said to be much more artistic, and more readily adapted to their surroundings, than the ordinary form of portable table lamp. They have a quiet dignity about them that appeals to the folk who like to be associated with things of the better sort. The collapsible frame allows the shade to open and close like a parasol, thus producing different lighting effects in different positions. These lamps weigh only 5 pounds each and can easily be moved about. There are no glass shades to break, and the shades can be renewed at will so that the lamps can easily be designed to harmonize with the rest of the room furnishings. In addition to the ordinary sizes of portable lamps this company is getting ready to market a line of small table or bedroom lamps with similar collapsible frames.

Wisconsin Small Lighting Plant

This small lighting plant, like similar outfits shown from time to time in this department, consists of a gas operated engine, a generator, a storage battery, and a switchboard. The engines are built especially for this service—they are equipped with throttling governor of the same type as used in large power plants, assuring uniform speed and steady light. The inlet and exhaust valves are of the vertical poppet type and are easily accessible, although vertical valves need little attention, there being no side friction causing them to wear and to require regrinding. Mounted on skids, the engine can be disconnected from the generator in a minute and drawn anywhere on the place. It soon saves its small cost in time gained by pumping, separating, churning, washing and doing a multitude of other jobs about the farm.


Wisconsin lighting plant. Lauson-Lawton Co., De Pere, Wis.

This plant is made in four sizes, 15 lamp, 30 lamp, 50 lamp, and 100 lamp respectively. The 15-lamp size has a 15-ampere, 30-volt generator operating at 1,800 r.p.m.; the 30-lamp size has a 15-ampere, 40-volt generator also operating at 1,800 r.p.m.; the 50-lamp size has a 20-ampere, 40-volt generator operating at 1,200 r.p.m.; and the 100-lamp size a 37-ampere, 40-volt generator operating at 1,700 r.p.m. All four sizes have suitable switchboard and storage battery equipments. They are made by The Lauson-Lawton Co., De Pere, Wis.

Diehl Interchangeable Fractional Horsepower Motors

The Diehl Mfg. Co., of Elizabeth, N. J., is marketing a new line of fractional horsepower motors for use on direct and alternating current circuits. The whole line is built for interchangeability between similar direct and alternating ratings. This enables one to use one design of base, bracket, and motor space without regard to the character of current to be used. The motor feet do not project beyond the body lines, and are drilled for attachment purposes.

The manufacturer claims that curves plotted from the performance of a direct current motor showing characteristics from no load to full load will be practically identical with curves plotted from the performance of an alternating current motor under similar operating conditions, and vice versa.

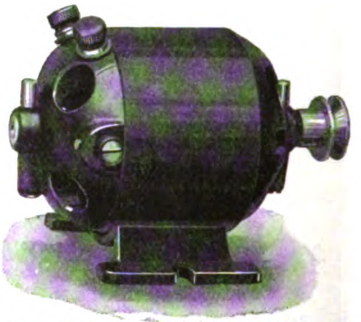
The two smaller frames of this new line are rated 1/50th and 1/25th horsepower, respectively, at 1725 r.p.m. These motors have die cast shells and covers. The larger sizes up to ¼ h.p. are furnished with cast iron frames and covers.

These motors will develop a starting torque equivalent to not less than 150 per cent. of full load running torque.

Interchangeable fractional horsepower motors. Diehl Mfg. Co., Elizabeth, N. J.

Bodine Small Motor

The Bodine Electric Co., 564 West Randolph street, Chicago, Ill., has recently put on the market the new small motor shown below. This new type is made in a number of sizes ranging in horsepower from 1/100 to 1/10, and is wound for operation on either direct or alternating current. The manufacturers claim that they have practically overcome the excessive sparking at the brushes commonly found in commutator type motors operating on alternating current.

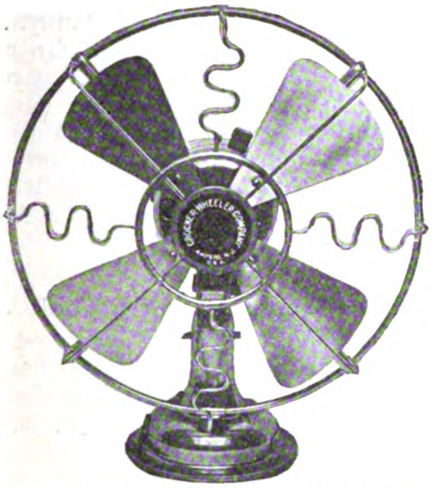

Fractional horsepower motor, ranging from 1/100 to 1/10 h.p. Bodine Electric Co., 564 West Randolph street, Chicago, Ill.

Kazoo Variable Speed Single-Phase Power Motor

This motor has just been put on the market by the Kalamazoo Electric Motor Co., 648 Willard street, Kalamazoo, Mich. It has a capacity of ⅛ h.p. when operating on 110-volt, 60-cycle, single phase circuits. This motor is adapted for use on motion picture machines, dental machines, printing presses, washers, signs, and optical appliances.

Crocker-Wheeler 9-inch Fan Motor

The Crocker-Wheeler Co., Ampere, N. J., has placed on the market this year an additional type of 9 in. alternating current fan which embodies some novel features. In place of the usual rheostat lever for securing different fixed speeds, the speed is varied by rotating the core containing the windings inside of the fan housing. Not only can fine adjustment of speed be secured, but the current consumption varies with the speed, so that while the power consumed at full load is about 24 watts, the power consumed at low speed is approximately 7 watts.

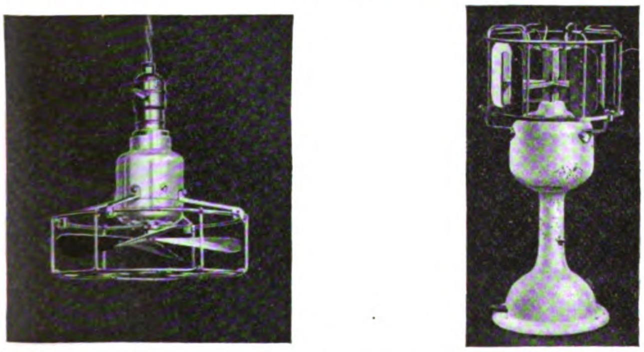


Alternating current 9-inch fan motor. Crocker-Wheeler Co., Ampere, N. J.

The fan is started and stopped by means of a push switch located in the base. It can be started and stopped at any speed at which it is fixed to run.

Menominee 8-inch Fans

The Menominee Electric Mfg. Co., Menominee, Mich., has just brought out the two new 8-inch fans shown in the annexed illustrations. One is a socket fan, the other a horizontal table fan. The socket fan weighs 2¾ lb. and can be fitted directly into a standard incandescent lamp socket. The horizontal table fan is finished in white enamel and nickel plate to harmonize with the table linen, silver, glass, and china. It is ornamental enough to use for a centre piece in warm weather. It distributes the air evenly around the table and at such elevation so as not to chill warm foods.

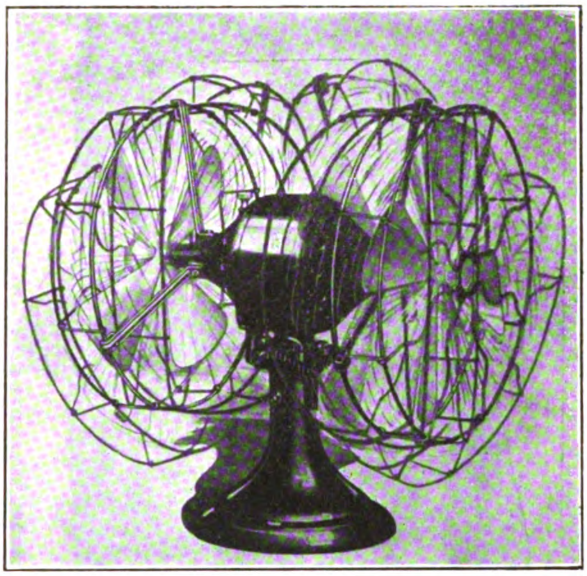


New 8-inch white enamel socket and horizontal table fans. Menominee Electric Mfg. Co., Menominee, Mich.

Storm Wave Fan

A new line of fans is now being offered to the trade by the Allied Electric Co., 105 North Clark street, Chicago, Ill. This fan is made in several types, among them being 12 and 16 inch desk fans; 12 and 16 inch desk fans with two sets of blades, one on either side of the motor; 10, 12, and 16 inch desk and bracket fans; and 12 and 16 inch column fans.

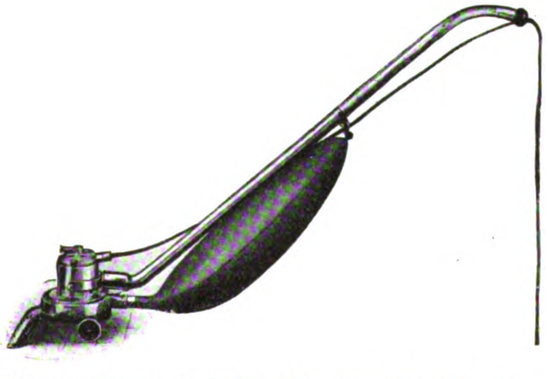
The 12 and 16 inch desk fans may be set to rotate and at the same time to tilt up and down automatically, or to tilt up and down and not rotate, or to remain stationary in any position desired. It is fitted with three-speed regulators. The 12 and 16 inch desk fans with two sets of blades may be set to oscillate back and forth and to tilt up and down automatically, or to rotate and at the same time to tilt up and down, or to tilt up and down but not rotate, or to remain stationary in any position desired. The 10, 12, and 16 inch desk and bracket fans are operated without cranks, and can be set to oscillate at ranges from a complete circle to any part of a circle. The range of oscillation may be changed or entirely stopped while the fan is running, by simply turning a knob. The column fan has four different motions: It may be set to oscillate back and forth and to tilt up and down automatically, or to rotate and at the same time to tilt up and down, or to tilt up and down but not rotate, or to remain stationary in any position.



Double blade fan. Allied Electric Co., 105 North Clark street, Chicago, Ill.

Invincible Vacuum Cleaner

The accompanying cut shows a new type of vacuum cleaner which has recently been brought out by the Invincible Mfg. Co., Pittsburgh, Pa. This machine is made of aluminum, is equipped with castors for easy

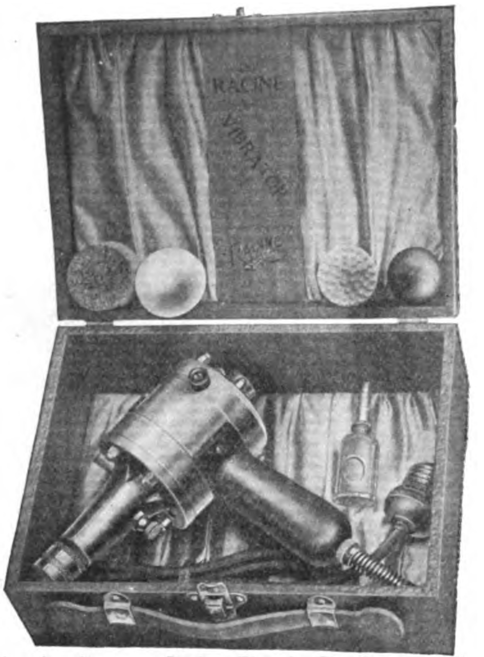


Vacuum cleaner. Invincible Mfg. Co., Pittsburgh, Pa.

movement, and has a dust bag of ample capacity attached to the handle It is operated by a fractional horsepower motor made by the Peerless Electric Co., of Warren, Ohio.

Racine Vibrator

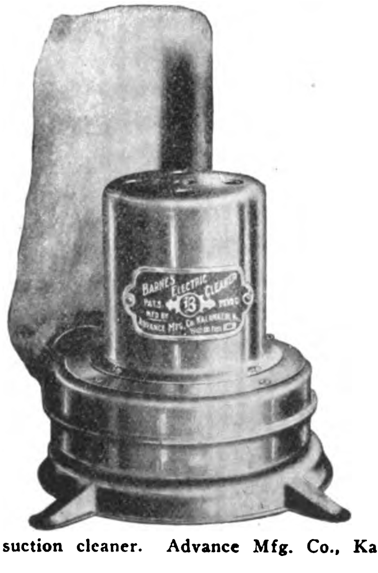
A new form of electric vibrator that will operate on any lighting circuit, alternating or direct, 110-130 volts, is shown herewith. It is made by the Racine Electric Co., of Racine, Wis. It is packed with four kinds of attachments, oil can, and connecting cord and plug in a neat box with leather handle. The speed can be regulated by means of a screw on the housing.



Electric vibrator. Racine Electric Co., Racine, Wis.

Barnes Electric Suction Cleaner

This cleaner which has been on the market several years has been re-designed and now appears in a type that departs in many ways from the old type. In the type of cleaner shown in the accompanying cut the motor is mounted on a separate aluminum frame made from die castings. In this method of mounting the bearings are removed from the machine case, thus preventing their being thrown out of alignment should the machine be jammed. This feature also gives easy access for adjustment and repair purposes. Wick oilers form part of the frame.



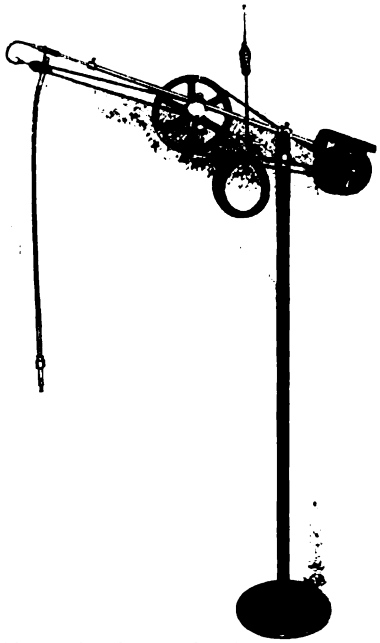
Barnes electric suction cleaner. Advance Mfg. Co., Kalamazoo, Mich.

This cleaner sits evenly on its base of polished steel. So small is the friction between this base and ordinary household furnishings which it is called upon to clean, that it is not equipped with castors. Not having castors, its direction can be changed instantly.

This cleaner weighs only 7 lb. The fan revolves at 6500 r.p.m. It is equipped with 25 feet of cord, and a switch near the handle for shutting off current. The suction fan is made of aluminum. When necessary the motor can be lifted out of its bearings and sent to the factory for repair. It is so light in weight that it can be sent through parcel post. Made by Advance Mfg. Co., Kalamazoo, Mich.

Stow General Utility Tool

Die sinking, drilling, buffing, grinding, and other mechanical operations of like nature can be done with the new motor driven general utility tool recently brought out by the Stow Mfg. Co., Binghamton, N. Y. This tool operates at a speed of 400 to 7,000 r. p. m. It is operated by either an alternating current, 110-220-volt, 60-cycle, single phase motor, or a 110-220 direct current motor.



General utility tool. Stow Mfg. Co., Binghamton, N. Y.

This device is also furnished in a suspended type instead of with a pedestal, if desired. The suspended type is attached to an overhead hook by means of another hook placed on the counterweight bar in such position that when suspended the weight of the motor is balanced by a movable counterweight placed at the other end of the suspension bar.

Doty Vacuum Cleaner

This cleaner is operated by a General Electric motor that runs on either alternating or direct current at a cost of about 1.3 cents an hour. The motor is cooled by a direct current of air from the fan. It is placed in an aluminum case and mounted on oilless bearings. The fan revolves at 9,000 r.p.m. A gear-driven brush in the nozzle picks up all the lint, thread, hair, ravelings, etc., from the floor coverings, loosens the particles of dirt, so that the powerful suction instantly removes them, and brightens the carpet. The nozzle adjusts itself to any angle at which the cleaner is operated, or to any kind of carpet. All wires, except those running to the light socket, are enclosed; the current is controlled by a press-the-button switch, conveniently located in the pistol-grip handle; the dust sack is a quick-detachable model.

This cleaner weighs 8 lb. and is made by The Doty Mfg. Co., Dayton, Ohio.

Western Electric Dishwasher

The Western Electric Co., 463 West street, New York, is offering the trade a new motor-driven dishwasher which may be permanently installed or moved about on casters. The annexed illustration shows the interior of the machine with the rack of dishes and the basket containing glasses and silverware in position.

Electric dishwasher. Western Electric Co., 463 West street, New York.

Beneath the circular tank, a ¼ h.p. Western Electric motor is direct connected to a small centrifugal pump which forces hot soapy water through a perforated pipe in the center of the machine and out over the dishes until they are thoroughly cleansed.

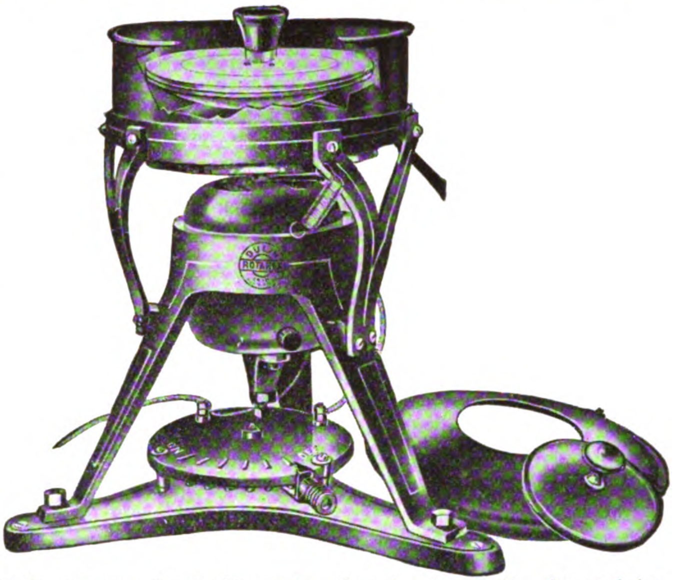
The washing water is then drained off, hot rinsing water run in, and the dishes rinsed by running the motor again for a few seconds. The dishes in the machine being above the water level and in a vertical position, the water drains off, while the combined heat from the direct contact with the hot water and the contained heat in the tank dries the dishes. During the entire operation of washing, rinsing and drying, which takes less than five minutes, the dishes remain stationary in the machine, thus eliminating any danger of breaking or chipping.

Two types of machines are furnished: the type A machine which is made of Premier brand stannic metal, non-rusting, suitable for the average home; and the type AC machine which is made of heavy copper, nickel-plated.

Dulin Rotarex

The Dulin Rotarex is a centrifugal machine designed for extracting bituminous aggregate, and is especially adapted for analyzing paving and road compounds, such as bitulithic, macadam, and ordinary surface mixtures. A simple speed changing switch on the base accommodates the machine to various mixtures.

This little machine does in a few minutes the work that required several hours with older methods. Tests have proved that an inexperienced operator can do the work formerly taking 3½ hours in 6 minutes. Samples can be taken from mixers or wagons and their constitution determined before dumping, and without delaying the work. In this way exact information can be obtained at every step, proportions checked, and weighings verified, without loss of time or risking faulty work. The states of New York, Pennsylvania, Maryland, West Virginia, and New Jersey and many of the largest cities rely entirely on this little machine.

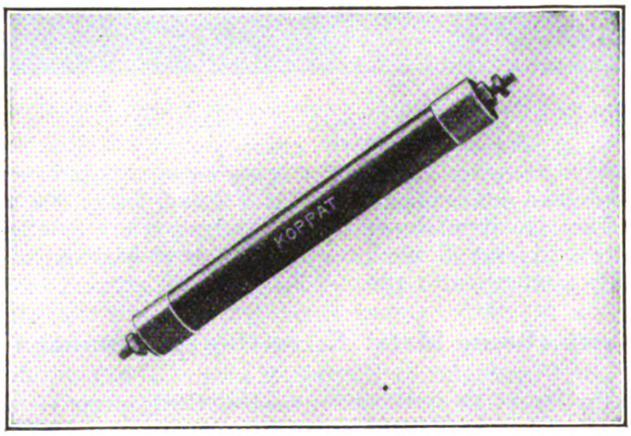


Dulin rotarex. Braun Corporation, Los Angeles, Calif. Operated by Westinghouse motor.

The Rotarex is small and can be easily carried from place to place. It is driven by a Westinghouse high speed motor, which will operate on any lighting circuit. It is manufactured by the Braun Corporation, Los Angeles, Cal.

Koppat Resistor

A new resistor known as "Koppat" is being placed on the market by the Railway and Industrial Engineering Co., of Greensburg, Pa. It is a vitreous composition material which can be made in various shapes and dimensions and of ohmic resistance to meet most commercial requirements. Its electrical and physical properties, it is claimed, combine to make it best suited to meet the requirements for which wire wound resistance is now generally used.



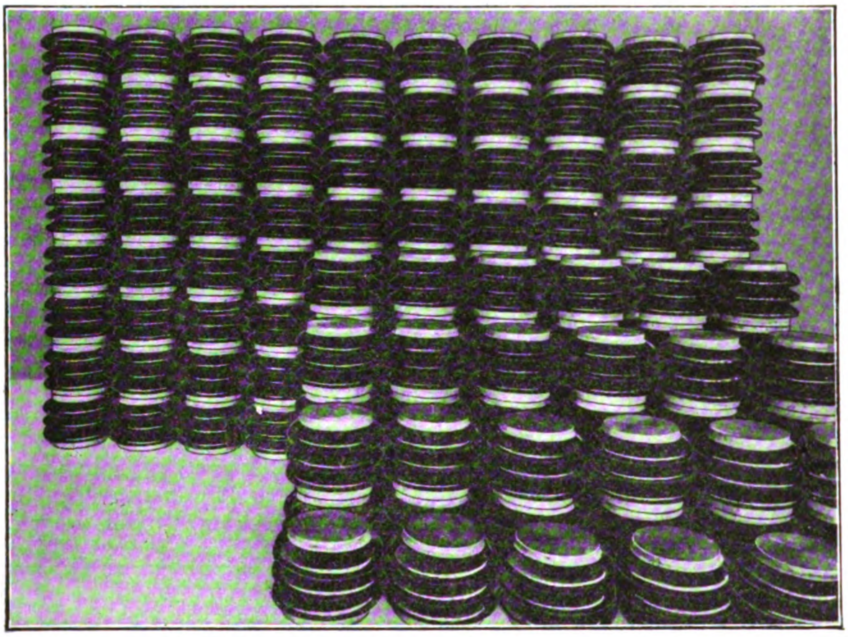
Koppat resistance. Railway and Industrial Engineering Co., Greensburg, Pa.

The resistance was originally developed for use in connection with the Burke horn gap lightning arrester. This service called for a resistance that was weatherproof in every respect and one capable of withstanding extremely heavy current momentarily, with attending strains. It has proved so satisfactory in connection with various classes of lightning arrester work that it is being placed on the market for other commercial needs, such as switchboard work, rheostat service, storage battery charging, and as permanent or limiting resistance to be used with arc headlights and signals, and in the form of resistance units mounted on brackets for various services.

Derry Wet Process Insulator

A demand for a small compact wet process insulator for sustaining heavy loads has resulted in the Pittsburg High Voltage Insulator Co., Derry, Pa., placing on the market a type of insulator shown in the accompanying illustration.

The bearing surface of the insulator is 9 in. in diameter, and stands 10 in. high and provided with petticoats or corrugations to increase the creepage distance under conditions when it is raining or storming. It is provided with a metal cap and base for attaching to bottom of towers, the object being to provide an insulated base for support and insulation of heavy towers.



Derry wet process insulator. Pittsburg High Voltage Insulator Co., Derry, Pa.

The insulators shown in the illustration are to maintain a 500,000 lb. compression load, and have an ultimate strength of 1,150,000 lb.

Westinghouse Metal Extracting Electromagnet

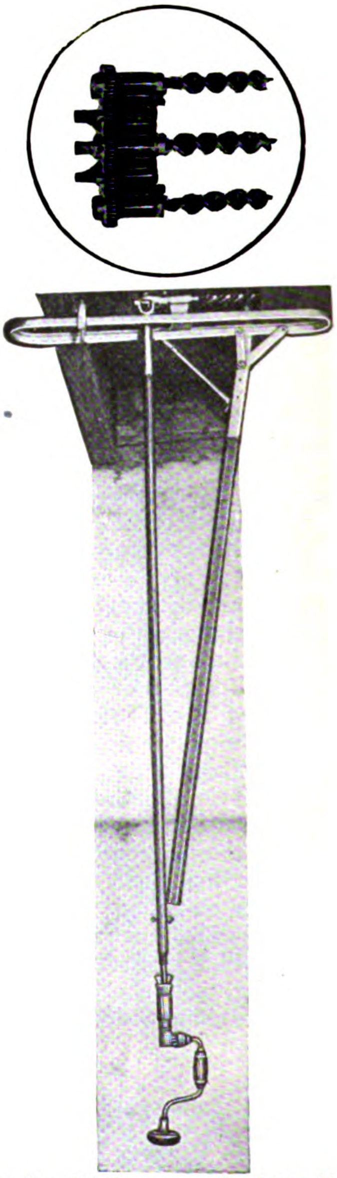
The Westinghouse Electric & Mfg. Co. has installed in the Relief Department of its East Pittsburgh Works a powerful electromagnet for removing metal embedded in the flesh.

The magnet is mounted on a box containing the resistor which is used to regulate the amount of current flowing through the coils. It requires 4000 watts for its operation, or enough power to supply 100 32-candle-power mazda lamps. It is designed for operation on 70 volts, and as the circuit from which it draws current is used for testing purposes in the works and ranges from 70 to 120 volts, a resistor is necessary.

It is not an infrequent occurrence for steel and iron workers to get bits of metal in their eyes or hands. Previous to the installation of a magnet the only means of removal was by probing, a method which is as uncertain as it is painful. Since this machine was put in operation it is a very simple proceeding to extract such particles. The portion of the body in which the foreign particle is embedded is placed near the pole tip of the magnet, the switch closed, and the magnet does the rest. The pole is removable, a number of different shapes being supplied for various classes of work. This device is said to have met with ready favor by the surgeons and nurses in charge of the American war hospital in Paris.

Turgor Borer

Contractors will be interested in a novel boring tool which has just been put on the market by the Turgor Borer Co., 580 Bay street, Stapleton, Staten Island, N. Y. By means of this tool holes can be easily and quickly bored in awkward places that have heretofore had to be tackled by means of a step-ladder and ratchet brace. As shown in the cut these holes can be bored three at a time, and, if desired, at right angles to the direction of the bore made by ordinary bit and brace

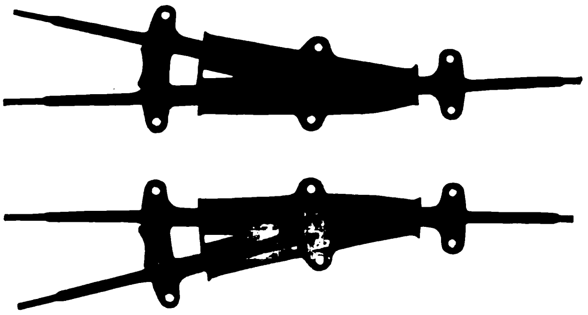


Turgor borer. The Turgor Borer Co., 580 Bay street. Stapleton, N. Y.

operation. It clamps in place in a few seconds and bores straight through the beams, there being no zigzag holes due to faulty driving.

Westinghouse Trolley Frog

The latest development in way of a frog for use on trolley roads is shown herewith. It is made by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. This is a trolley frog without movable parts that can be used successfully at points where high speeds are obtained. The design is such that the trolley wheel does not travel on its flanges, and no bump occurs when the bearing of the wheel is transferred from the groove to the flange. It is this bump that invariably dislodges the wheel from the wire. This frog is said to be the only frog that keeps the trolley wheel on the wire without the aid of mechanical or electrical accessories. It is made of malleable iron instead of bronze.



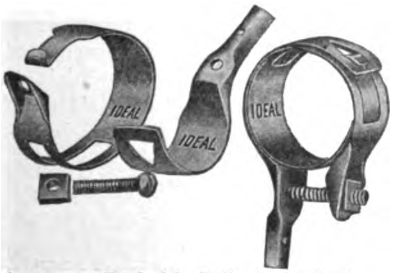
Type BR malleable iron trolley frog. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

This type can be placed almost directly over the track switch point, preventing the side wear of the wire caused by the wheel riding angularly before entering the frog. When the frog is placed in its proper position the wheel will be in a position to engage the turnout runner before it commences to grind the side of the wire. Due to the overlapping of the runners as shown in the illustrations, there is practically a continuous contact of the tread of the wheel during the period of transition.

The cuts show the frog for 15-degree angle designed for city service, though the company is prepared to furnish this type of frog in either an 8 degree or 10 degree angle for high speed interurban service.

"Ideal" Ground Clamp

The "Ideal" ground clamp consists of two strips of brass, of different gauges and widths. The longer strip is formed at end with a punched lug, through which the brass clamping screw extends, and a slot 1½ by ⅜ inches. The opposite end is narrowed to fit the slot and is bent to form a hook, as shown in the annexed cut. The second strip is formed at one end with a similar lug for the clamping and at the other with a triangular eyelet. When assembled the hook end of the longer strip is extended through the slot in the opposite end and into the eyelet in the second strip, forming a band which fits loosely around the pipe or conduit to be grounded. The shorter strip attached to the end of the first strip is then bent around until the punched lugs are in line, permitting the clamping screw to be placed in position. As the screw is tightened, drawing the ends together, the shorter strip draws the narrowed end of the other through the slot, thus reducing the circumference of the band until it is tightened on the pipe or conduit. The lug for connecting the ground wire is formed on the outer strip, as shown. It is of proper size to receive a No. 4 B & S gauge wire. It is made by Frederick Rall, 19 Park place, New York.

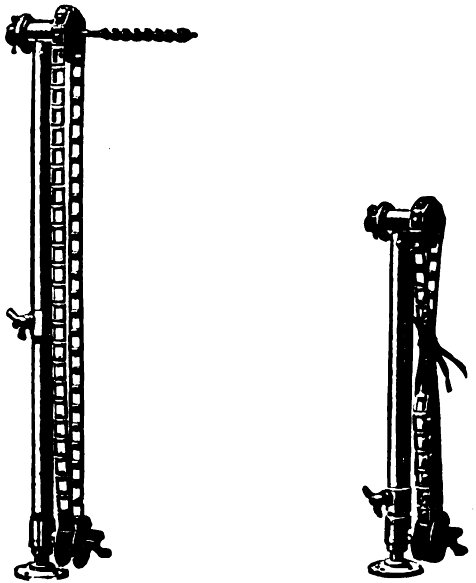


Ideal ground clamp. Frederick Rall, 19 Park place, New York.

Henderson Universal Hand Boring Machine for Electric Light Wiring

The Henderson Electric Co., Ampere, N. J., and Charlottesville, Va., have placed on the market a tool bag type of their large machine. Weighing only 6 lb., its working length is 28 inches, while collapsed ready for the tool bag, its length is 18 inches.

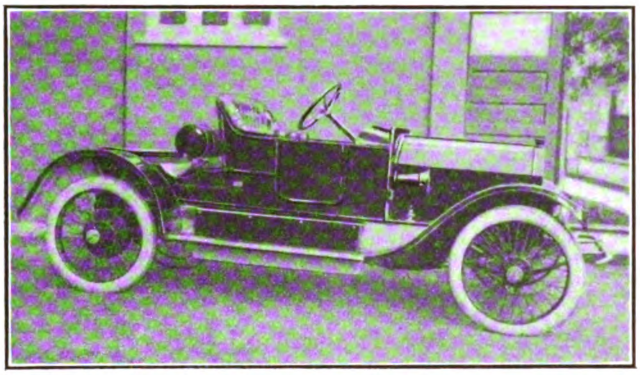
All working parts are interchangeable throughout with the large machine, the chief difference being that while the large machine stands on the floor and is suitable only for boring joists, the small machine is used in a similar manner to a breast drill and can be used for boring holes at any angle, through joists, plates and studding. It is particularly well adapted for boring holes for wires under floors in old buildings and in places practically inaccessible to any other device. The holes are straight, making it easy to draw in wires, armored cables, or flexible conduits.



Universal hand boring machine. Henderson Electric Co., Ampere, N. J.

Storage Gas-Electric Car

The Galt Motor Co., 8 Dickson street, Galt, Ontario, is about to market a new type of combination gasoline-electric automobile. A cut of it is shown herewith. The gasoline motor is direct connected to a direct current generator which in turn charges a storage battery of ample capacity. This combination car is said to possess all the advantages of both gas and electric cars, without any of the shortcomings of either type. There is a direct drive at all speeds, no clutch or transmission being used. It is also equipped with electric brakes, an electrically driven tire pump, and an electric vulcanizer. It has a self-starter equal in speed and power to the gas motor itself, by using the generator as a motor to crank the engine. The battery has sufficient capacity so that the car can be driven from 10 to 15 miles without being replenished with energy from the generator or using the gas motor. The maker claims that the battery is ample in size to carry all the peak loads, such as occur on up grades or at high speeds. On down grades or at reduced speeds the generator charges the battery. This floating the battery on the line is said to have the effect of making all roads level and all speeds one constant speed. This combination outfit is said to have only half the number of parts of the regular gas car. By actual test this car has performed 87 ton-miles on one gallon of gasoline. It will will not stall in traffic if the gas motor runs out of fuel, as the burden can then be turned over to the electric motor and storage battery.



Storage gas-electric motor car. The Galt Motor Co., 8 Dickson street, Galt, Ontario.

Mercury Pullem Industrial Tractor

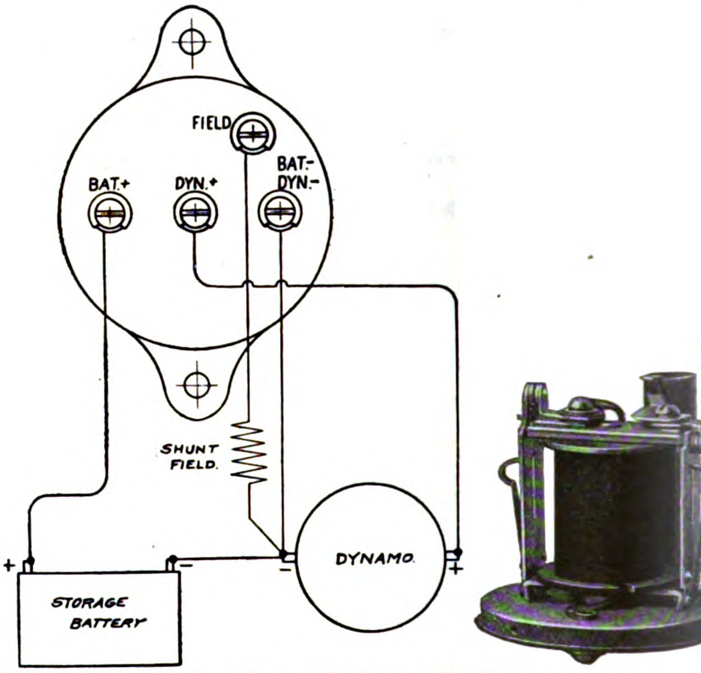
The accompanying cut shows an electrically operated industrial tractor now being marketed by The Mercury Mfg. Co., 4110 South Halsted street, Chicago, Ill. This tractor does not carry loads itself, but can be connected up at a moment's notice to one or many loaded trucks and will transfer them to any part of a factory. The trucks may be loaded and set to one side where the "Pullem" can pick them up in making its rounds at regular intervals. One man can thus do the work that would ordinarily require a large number.

Pullem industrial tractor. The Mercury Mfg. Co., 4110 South Halsted street, Chicago, Ill.

Being of the three-wheel type, this tractor is easy to handle on a short radius. The wheels are cast of semi-steel and equipped with solid rubber tires. It is steered by the front wheel. The electrical equipment on this tractor consists of a storage battery, a four-speed forward and two-speed reverse controller, and a heavy duty electric motor.

Carleton Combination Electrical Regulator and Cutout

The Carleton Co., 174 Summer street, Boston, is marketing a new combination electrical regulator and cutout for use in connection with their automobile lighting generators. This performs the double function of regulating the output of the generator, regardless of the speed at which the armature revolves, and of breaking the circuit between the generator and battery when the generator is not running, thus preventing discharge of battery back through the generator. It is electromagnetic, consisting of two armatures, a shunt and a series coil, and a resistance which is introduced into a shunt field by means of the vibrating armature. The series coil is common to both the regulator and cutout. Contacts are double, one carbon and one of bronze with sliding contact, hence neither will "freeze."



Combination electrical regulator and cutout, with diagram of connections. The Carleton Co., 174 Summer street, Boston, Mass.

The action of the cutout is as follows: When the generator is started it energizes the fine wire shunt coil which pulls in the carbon tipped armature. This throws the coarse wire series coil into circuit and completes the battery circuit, the current naturally following the series route. When the generator stops or slows down sufficiently a spring opens the circuit and this action is aided by the reverse battery current.

The regulator action is as follows: When the current in the series coil rises to the point determined for regulation—which is seven amperes in the carleton No. 68 generator—the vibrating regulator circuit is opened and resistance introduced in series with the shunt field, this in turn causing the charging current to drop sufficiently to allow the regulator to return to its normal position, short-circuiting the resistance. This cycle of operation is constantly repeated, causing the generator current to remain constant over a great range of speed.

The device weighs about 1 lb., measures 2¾ in. by 2¾ in., and is usually mounted on the dash under the hood. It is entirely enclosed by a stamped steel case which fastens to the heavy fibre base by a snap lock.

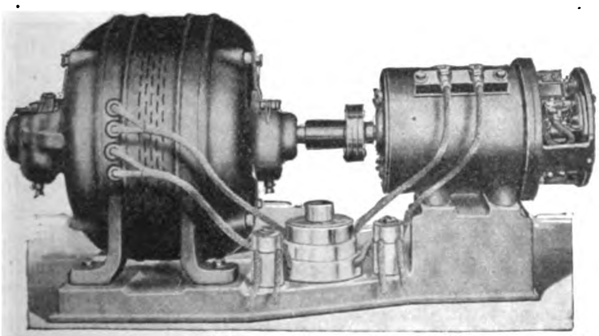
Victor S.O.S. Starting Battery

The accompanying cut shows a new starting battery now being offered to the trade by the Victor Storage Battery Co., Rock Island, Ill. This battery is designed for use on 6-volt automobile starting systems. It can also be used for lighting. It is made in four styles, weighing 50, 59, 69, and 80 lb. respectively. When used for lighting it will furnish from 3 to 10 amperes of current at 6-volts for a number of hours, the number of hours varying with the type of battery. The smaller type has a capacity in ampere-hours of from 70 to 105, according to the rate of discharge. The largest type has a capacity of from 160 to 195 ampere-hours. The makers claim that dead short circuits will not harm them, and that they will stand idle for months without care or attention and maintain their full rate of discharge.

Victor S.O.S. starting battery. Victor Storage Battery Co., Rock Island, Ill.

Wagner Battery Charger

The increasing use of small storage batteries, especially for automobile lighting and ignition, makes it necessary for the garage to be equipped to economically charge these batteries. The motor-generator set for charging such batteries, illustrated herewith, is manufactured by the Wagner Electric Mfg. Co., St. Louis, Mo.



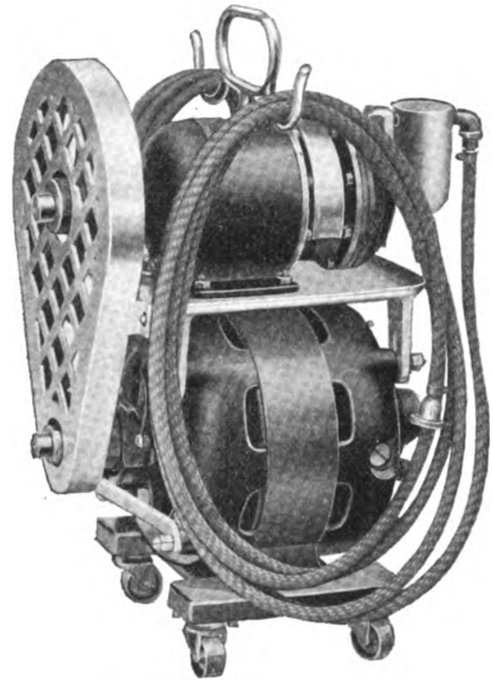
Garage battery charger. Wagner Electric Mfg. Co., St. Louis, Mo.

The generator is identical with that supplied as a part of the Wagner self-starting system. The characteristics of the generator are such that the charging rate is automatically controlled, without the use of any, external device. Generators are supplied for either 6-volt or 12-volt batteries. The 12-volt charger will charge one 12-volt battery or two 6-volt batteries in series.

The motor is a standard single phase machine designed to operate on 60 cycles, the usual lighting circuit frequency, and on either 110 or 220-volt circuits. A direct current motor may be supplied for operation on 110 or 220-volt circuits.

Utility Air Compressor

A compact motor driven air compressor that can be utilized for many different purposes, has recently been put on the market by the Utility Compressor Co., Detroit, Mich. The accompanying cut shows what it looks like. A ½ h.p. motor is used for driving it, direct or alternating current motors operating on either 110 or 220 volts being supplied according to local operating conditions. The drive is by means of a silent chain. The machine is mounted on roller castors and is finished in gloss black enamel with brass and aluminum fittings. The equipment includes 15 feet of covered hose with tire connection attached, 15 feet of electric cable with plug attachment, and an oil separator between the compressor and the hole. It is 14 inches long, 9 inches wide, and 20 inches high. It weighs 100 lb.



Garage utility compressor. Utility Compressor Co., Detroit. Mich.

Tipless Nitrogen Filled Lamp for Automobiles

One of the latest types of gas filled lamps for automobiles to be placed on the market is manufactured by the Vosburgh Miniature Lamp Co., of 287 Valley road West Orange, N. J.

The main features of these lamps are their focus, brilliancy, life, and efficiency, consuming approximately ½ to ¾ watts per candle. The use of nitrogen filled high efficiency lamps for automobiles is a novelty. By means of this lamp it is said that the increasing restrictions about illuminating the tail number plate will be met promptly and effectively.

Nitrogen filled automobile lamp. Vosburgh Miniature Lamp Co., 387 Valley road, West Orange, N. J.

Tungsten Lamp Dimmers

At the time when tungsten lamps first came into general use, said F. E. Waller at the recent mid-winter meeting of the A. I. E. E., the design of theatre dimmers for carbon lamps had become fairly well standardized. A rheostat with 50 steps of resistance, and a taper of approximately 5 to 1 in ampere capacity had been found entirely adequate and satisfactory, and this design was practically universal. The dimmers which were built to regulate the illumination of carbon lamps were found unsatisfactory, however, when the carbon lamps were replaced by lamps having metallic filaments such as tungsten. Metallic filaments have a positive temperature coefficient of resistance, while carbon filaments have a negative temperature coefficient of resistance. If we start with two filaments of the same resistance, one of carbon and one of tungsten, and raise them to incandescence, the tungsten filament at its full incandescence will have thirty-five times the resistance of the carbon filament at its full incandescence. On account of this disparity, the control of tungsten lamps by dimmers designed for carbon lamps was uneven, the lights flickered considerably, and, in some cases it was found that desirable lighting effects obtained in the past could not be duplicated.

The negative temperature coefficient of a carbon filament produces a change of resistance which supplements the action of the dimmer, whether the light is being raised or lowered. When a carbon filament lamp is burning at half normal candle power and it is to be dimmed still lower, another step of the rheostat resistance is cut into circuit. Then the current flowing will be reduced, the filament will at once become cooler and will increase in resistance, this increase causing a further slight decrease in the current. Conversely, when any portion of the rheostat is cut out of circuit there is an increase in current which raises the temperature of the filament, and the corresponding decrease in its resistance allows a slightly greater current to pass, just as if another step of the rheostat were cut out of circuit. In this manner, the carbon filament acts to assist the dimmer, step by step, through the entire range of control. Of course this action is slight through most of the range, for the lamp resistance remains practically constant.

The tungsten lamp, on the contrary, opposes every attempt at control, and must be regulated by much finer divisions of resistance to get flickerless dimming. The design of a dimmer for carbon lamps is a comparatively simple matter as there is little change in resistance of the carbon filament between 10 watts and 100, watts, which represent approximately the practical working range of the lamp. That the lamps when in use may be totally extinguished without opening the circuit, it is customary to build the dimmer with enough resistance to reduce the input somewhat below 10 watts. With 110-volt tungsten lamps it was found that a 100-step dimmer with 1 volt regulation between steps was satisfactory. On 120-volt circuits 110-step dimmers are necessary.

Government Power Plant

J. W. Finch & Co., 414 Sixth street, Riverside, Cal., have just completed the construction of a 60,000-volt transmission line extending from the United States Reclamation Service power house, at Lahonton, Nevada, through the towns of Hazen and Lovelock, to the Rochester mining district, terminating at the stamp mill being erected by the Rochester Mines Co. This line was built under contract for the Nevada Valleys Power Co., who are leasing the government power plant. The plan of this company is to supply light and power in Lahonton, Fallon, Hazen, Lovelock, and Rochester. It is expected that the power will be used for general commercial purposes, irrigation and mining. The length of the line is 83.3 miles, and the construction of the greater part of the line was through open desert country. The substation installations which are now building, consist of three 625 kva. Westinghouse transformers at Lahonton, Nevada; three 37½-kva. Westinghouse transformers at Hazen; three 100-kva. Westinghouse transformers at Lovelock, and three 400-kva. Westinghouse transformers at Rochester. The different substations are equipped practically the same. They are all outdoor type substations and are each equipped with a type K. open air Bowie disconnecting switch. The transformation is from 60,000 volts to 6,600 volts, the 6,600-volt circuit being carried into a galvanized iron switch house. This switch house is all metal, angle iron corners and bracing being used throughout. In the switch house is installed a 6,600-volt oil disconnecting switch and a metal panel and lightning arrester rack. The 60,000-volt entrance to the substation is protected by a Bowie lightning arrester before which is placed a type I Bowie disconnecting switch. Sectionalizing switches are placed in the line behind the substations at Hazen and at Lovelock. These are also Bowie type K horn-gap switches. The transmission line was constructed during some very severe weather for that section of the country, work being prosecuted very often in zero weather. The line was completed in less than thirty days, the average progress being a trifle less than three miles per day. This was accomplished with an organization working from one end of the line. The stations were completed and current turned on on February 15.

AUTOMOBILE MATTERS

ELECTRIC VEHICLES—ELECTRICAL APPLIANCES FOR CARS, TRUCKS, AND GARAGES—NEWS AND ITEMS ABOUT THIS ACTIVE BUSINESS.

In December last the value of motor trucks exported from the United States was more than double the total value of all such trucks exported in the whole year 1913. The figures for last December, as reported by the Department of Commerce to the National Automobile Chamber of Commerce, are 1,279 commercial automobiles, valued at $3,387,729, as compared with 88, valued at $100,660, exported in December, 1913, and 1,009, valued at $1,686,807, exported in the twelve months of 1913. Passenger cars exported last December numbered 1,297, worth $998,-698, bringing the total automobile exports for the month to 2,576, valued at $4,386,427, as compared with 2,389, worth $2,152,144, in 1913, and 2,013, worth $2,-060,812, in 1912.

"Gear Shifting By Electricity" is the title of an unusually interesting and informing booklet recently issued by the Cutler-Hammer Mfg. Co., Milwaukee, Wis. Owners and operators of motor cars who wish to inform themselves about the mechanics of car operation, whether on a level, or up or down grade, will be benefited by reading it. This booklet also contains an illustrated story clearly explaining the elements of electric gear shifting design and operation.

A new field for the electric, and one rich with opportunity, says A. J. Marshall, secretary of the Electric Vehicle Association, is that of taxicab service, for which the electric vehicle is pre-eminently fitted. Because of the electric's fitness for this, and because of various advantages therefrom, the electric vehicle manufacturers are now enthusiastically pushing along this line of inevitable success. The most extensive application of electrics to taxicab service at present occurs in Berlin, where there are about 600 electric taxis, 1,600 gasoline, and 2,500 horse cabs. The Berlin municipal authorities have passed an ordinance limiting the number of gasoline driven cabs in order to prevent introduction into circulation of a number of gas cars in excess of public necessity.

Some interesting information in regard to the use of ultra-violet light rays in vulcanizing rubber as given in the December 14, 1914, issue of the *Scientific American* will doubtless prove of interest to many automobile users. The article in question says that dissolved rubber can be vulcanized without the use of heat, and can be kept in a semi-liquid state, although vulcanized, by a new method discovered by a German chemist, M. Heilbronner. Rubber is dissolved in a light hydrocarbon solvent, best in the proportion of 15 parts of solvent to 1 of crude rubber. A solution of crystallized sulphur in benzine is then added to the rubber solution and the mixture is subjected to the influence of ultra-violet rays, obtained by Cooper-Hewitt mercury vapor lamps in quartz tubes. The rubber in the solution combines with the sulphur, and when the solvent is allowed to evaporate the residue is pure vulcanized (insoluble) rubber. For repairing the vulcanized solution is used and the solvent is evaporated, giving a sort of "autogenous rubber welding" which fails to disclose the points of contacts. Where two rubber surfaces are joined by this vulcanized rubber solution, a homogeneous mass is formed.

The Southern California Edison Co. has 150 automobiles of all kinds in daily service. The 150 cars consist of 11 touring cars, 86 roadsters, 37 gas trucks, and 16 electric trucks. These cars represent an investment of over $200,000. All of them are kept in first class condition by expert mechanics employed for that purpose.

"Development of the motor truck, which is coming more rapidly into general use, will, in our opinion, tend to relieve congestion by moving all kinds of merchandise in larger units and more rapidly," says a committee of the Boston Chamber of Commerce in a detailed report on street traffic in that city as the result of a year and a half of study of conditions. The number of motor trucks licensed between January 1 and May 15, 1912, in Boston, was 2,500. During the same period of 1913 the number of such cars licensed was 4,400.

Brooklyn is to have an automobile show in the 23d Regiment armory during the week of March 2-9, 1915. Unlike the New York show, the Brooklyn people have made plans for the display of commercial vehicles, and this one feature is likely to make the affair a most successful one from a business point of view. It is believed that hundreds of business men in New York and Brooklyn and nearby cities will take advantage of the opportunity to look over the latest types of business cars. They are especially interested at this time because horses have advanced greatly in price as a result of the heavy demand from Europe.

The Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., announces the removal of the offices of its newly organized automobile equipment department from East Pittsburgh to Shadyside Station, Pittsburgh, Pa., where they will be located in the works devoted exclusively to the manufacture of Westinghouse automobile equipments. This department was organized on January 1, with G. Brewer Griffin as manager in charge. It takes the place of that formerly known as the automobile equipment division of the detail and supply department. In addition to the new headquarters, service stations have been established in New York, Chicago, Indianapolis, Cleveland, and Detroit.

MOTOR MARKETS

USES FOR MOTORS, GROUPED ACCORDING TO STATED HORSE-POWER LIMITS.

Motors of From 1-8 to 1-4 Horse Power

[MOTOR DRIVE SERIES—ARTICLE NO. 41]

The accompanying table gives the names of 150 devices that are capable of being operated by motors of from ⅛ to ¼ horse power, on circuits of 110 and 220 volts. This list of names therefore represents the market for such motors, and is indicative of the class of companies buying motors of from ⅛ to ¼ horse power. The list of devices does not tell whether the motor required should be ⅛, 1/6, 1/5, or ¼, but many of the

150 Uses for Motors of From 1-8 to 1-4 Horse Power

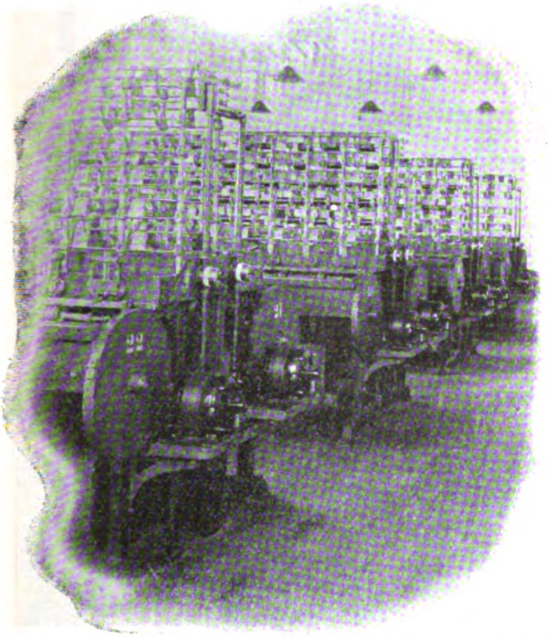
The following devices are capable of being operated by motors of from ⅛ to ¼ horse power on 110 and 220 volt circuits:

Adding machines
Addressing machines
Air brush outfits
Air compressors (small)
Bag filling machines
Beer pumps
Bench grinders
Bill counting machines
Blowers (small)
Blue printing machines
Boiler tube cleaners
Bottle capping machines
Bottle washers
Bottling machines
Bread wrapping machines
Button sewing machines
Candy mixers
Candy pulling machines
Canning machinery
Caramel wrapping machines
Carbonators
Car heaters
Churns
Circuit breakers
Cigarette machinery
Clothes washers
Coffee cleaners
Coffee grinders
Coffee roasters
Coin sorters
Conveyors (small)
Corn poppers
Cream separators
Cuspidor polishers
Dental compressors
Dish washers
Dough mixers
Drill presses
Drills, portable
Dumbwaiters
Egg beaters
Electric fountains
Electro-medical apparatus
Engraving machines
Envelope making machines
Envelope sealers
Exhaust fans
Fans
Faradic apparatus
Filing machines
Film drying drums
Film winders
Floor cleaners
Floor surfacers
Flour packers
Flower pot washers
Folding machines
Forge blowers
Foundry riddles
Fur sewing machines
Garage pumps (portable)
Gathering machines
Grinders (small)
Grindstones
Hack saws (small)
Handkerchief ironers
Hat cleaning machines
Hay cutters
Horse clippers
Horseradish graters
Humidifiers
Ice cream freezers
Ice crushers
Ironing machines
Jewelers' bench drills
Key cutting machines
Knife grinders
Lathes (small)
Lathe grinders
Laundry markers
Letter copying presses
Linotype machines
Machine tools
Magnetic separators
Mailing machines
Meat grinders
Medical saws
Milkers
Mold driers
Monotype casters
Moving picture machines
Numbering machines
Oil extractors
Organ blowers
Oscillators
Ozonators
Package tierers
Packaging machines
Pan greasers
Paper box machinery
Paper cutters (small)
Paper drills
Peanut roasters
Perforating machines
Phonographs
Piano players
Planing machines
Printing presses (job)
Proof presses
Pumps, house
Refrigerators (house)
Rheostats
Riveting machines
Routers
Ruling machines
Saw setters
Saw sharpeners
Saw trimmers
Sewing machines (family)
Sheep shearers
Shoe machinery
Shoe nailers
Shoe repair outfits
Sign flashers
Silver burnishers
Slotting machines
Spinning machines
Stitching machines
Stopper spinners
Suction pumps (medical)
Switches, automatic
Textile machines
Theatre dimmers
Thermostats
Tile polishers
Tire pumps
Tobacco cutters
Tool post grinders
Traveling letter boxes
Vacuum cleaners
Vacuum pumps
Varnish rubbers
Vegetable peelers
Ventilating fans
Washing machines
Weighing machines
Winding machines
Window display machines
Wire stitchers
X-ray machines

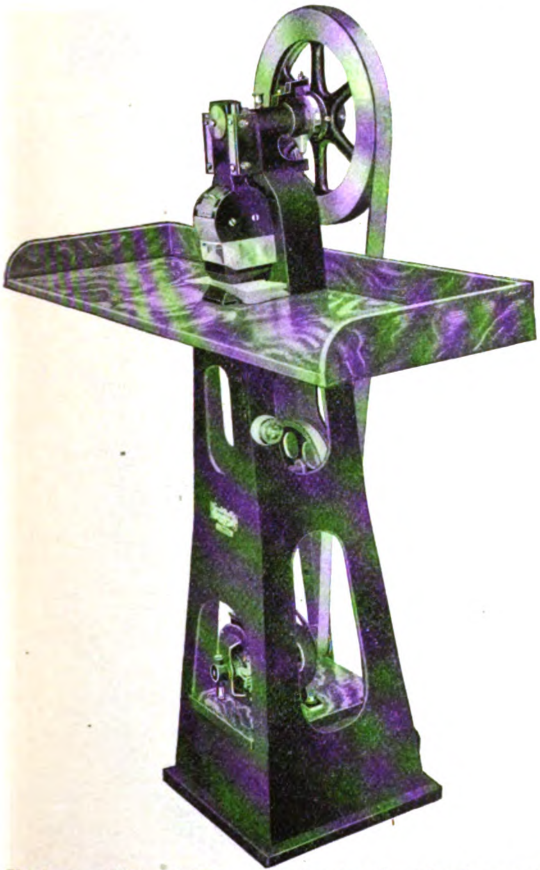
The illustrations show how motors are used for operating a number of these devices, and give definite information as to the exact horse power of the motor in each case.

devices mentioned are illustrated and the caption under the cut tells the exact horse power of the motor shown in each case.

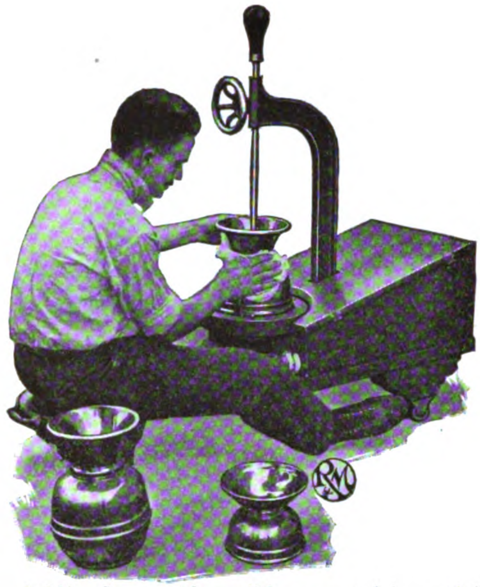
In a few instances it will be found that a motor capable of being operated on either direct or alternating current is required, and too in a number of cases it will be found that the motor forms an integral part of the device mentioned.



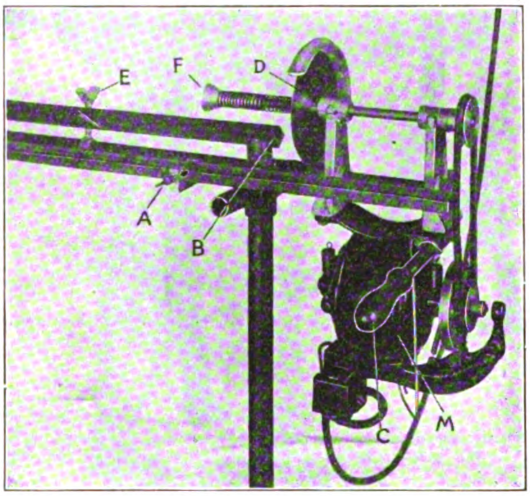
Textile machines, made by Textile Machine Works, Reading, Pa., each operated by a ¼ h.p., 220 volt, 1,700 r.p.m., compound wound, direct current motor, made by Fort Wayne Electric Works of G. E. Co., 1612 Broadway, Ft. Wayne, Ind.



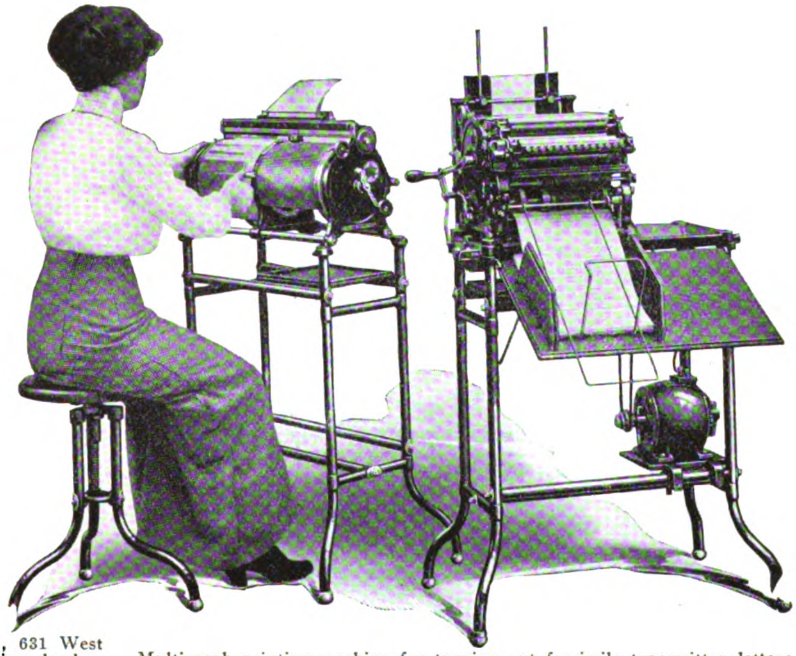
Check cancelling machine, made by American Perforator Co., 631 West Jackson boulevard, Chicago, Ill., for cancelling and dating bank checks, operated by a 1/6 h.p. motor, made by Bodine Electric Co., 564 West Randolph street, Chicago, Ill.



J. I. Holcomb Mfg. Co., cuspidor polisher operated by a ¼ h.p., 1,750 r.p.m., motor made by The Robbins & Myers Co., Springfield, Ohio.

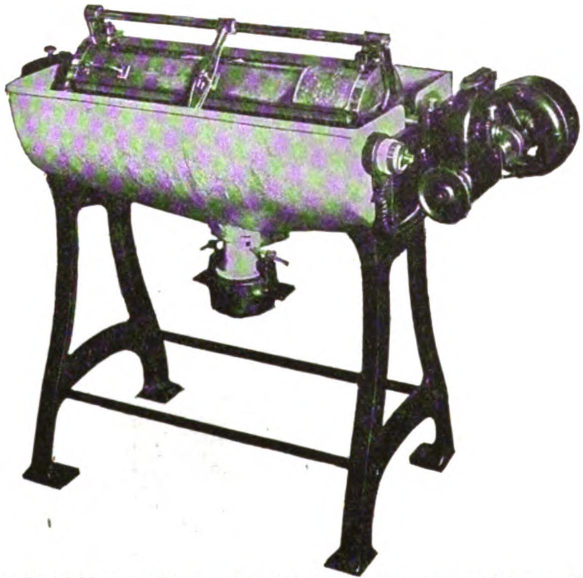


1/7 h.p., 110 volt, 2,800 r.p.m., d.c. motor made by Diehl Mfg. Co., Elizabeth, N. J., operating machine for boring shade rollers.

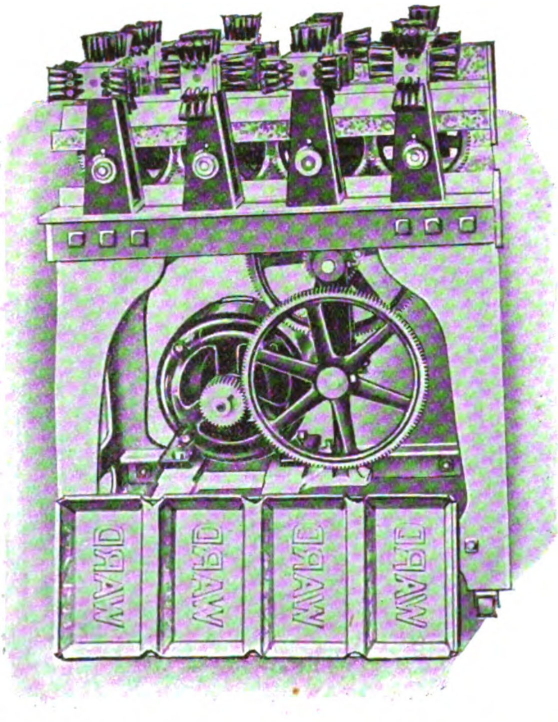


Multigraph printing machine for turning out facsimile typewritten letters, operated by a 1/6 h.p. motor, made by Bodine Electric Co., 564 West Randolph street, Chicago, Ill.

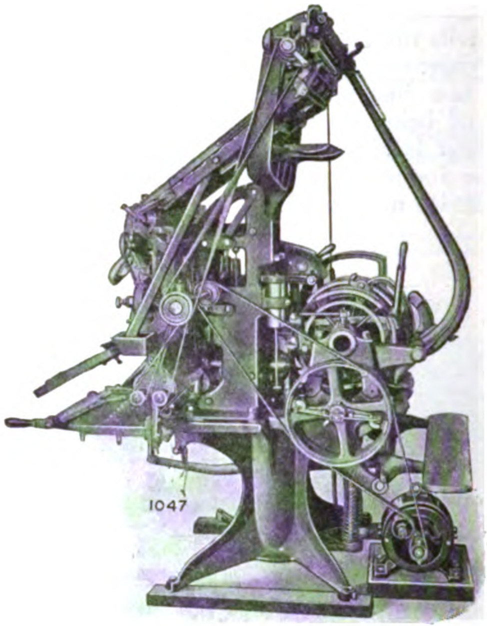
Twin burr coffee mill, made by Angldile Computing Scale Co., Elkhart, Ind., operated by a ¼ h.p., motor (single phase, a.c., induction, or compound wound, d.c.), 1,800 r.p.m.; especially designed for this service by Ft. Wayne Electric Works of G. E. Co., 1612 Broadway, Ft. Wayne, Ind.



Silver burnishing machine, made by Tahara Co., operated by a ⅛ h.p., 1750 r.p.m., motor, made by The Robbins & Myers Co., Springfield, Ohio.

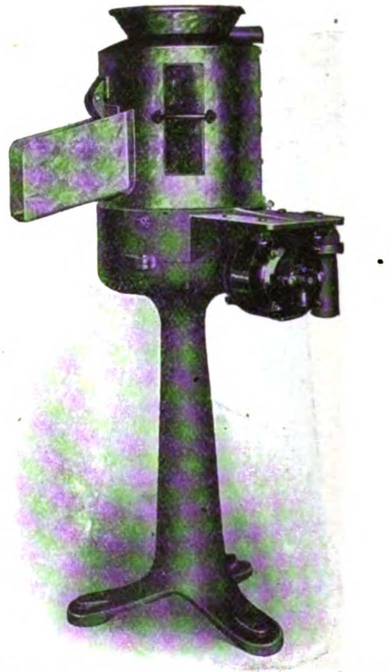


Gottschalk bread pan cleanser and greaser, operated by a ¼ h.p. motor made by The Robbins & Myers Co., Springfield, Ohio.

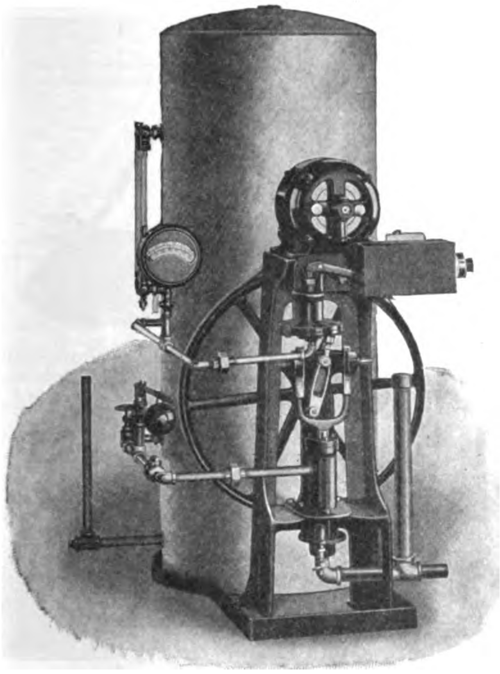


Merganthaler linotype operated by ⅛ h.p., 2,500 r.p.m., direct current motor made by The Robbins & Myers Co., Springfield, Ohio.

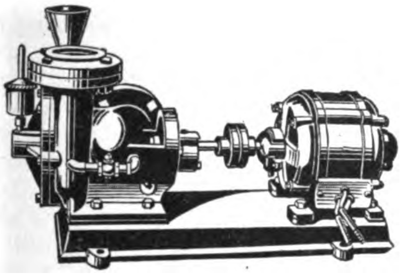
1/6 h.p., 1,800 r.p.m., induction motor, made by Western Electric Co., 463 West street, New York, operating cream pump in ice cream factory.



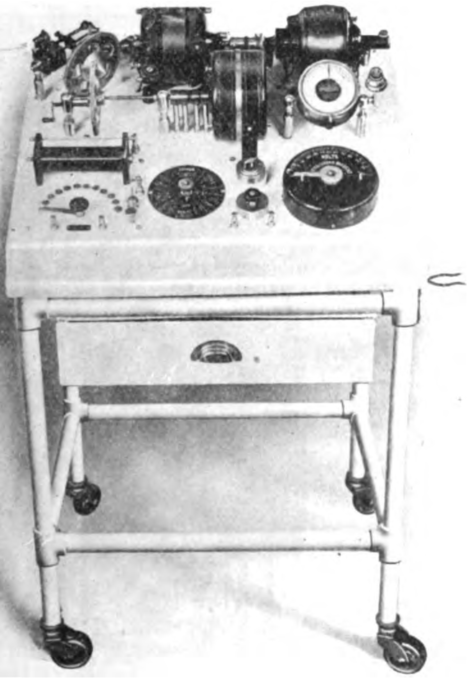
Fruit and vegetable paring machine, made by American Fruit Machinery Co., Philadelphia, Pa., operated by a ¼ h.p., 110 volt, 60 cycle, 1,800 r.p.m., induction motor, made by Ft. Wayne Electric Works of G. E. Co., 1612 Broadway, Ft. Wayne, Ind.



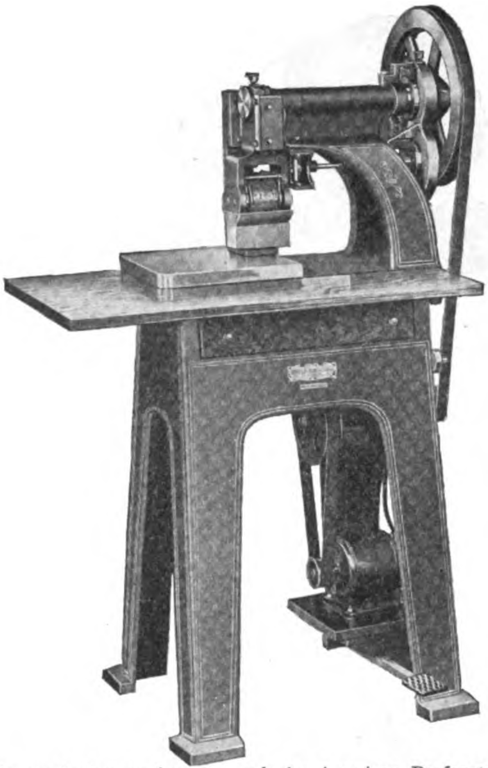
Water system for residences, made by Dayton Pump & Mfg. Co., Dayton, Ohio; pump operated by a 1/6 h.p., 1,200 r.p.m., motor (single phase a.c., or compound wound, d.c.), made by Ft. Wayne Electric Works of G. E. Co., 1612 Broadway, Ft. Wayne, Ind.



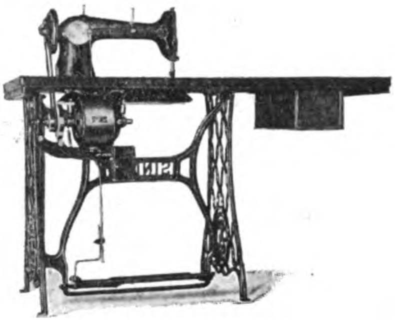
¼ h.p., 1,800 r.p.m., induction motor, made by Western Electric Co., 463 West street, New York, operating centrifugal pump.



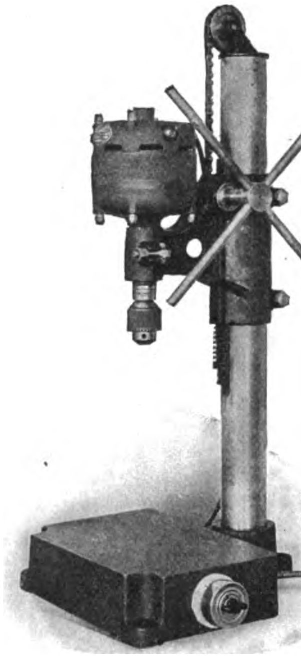
Universalmode sinusoidal machine, made by McIntosh Battery & Optical Co., 322 West Washington street, Chicago, Ill. Generating unit furnishing current, made by Bodine Electric Co., 564 West Randolph street, Chicago, Ill.



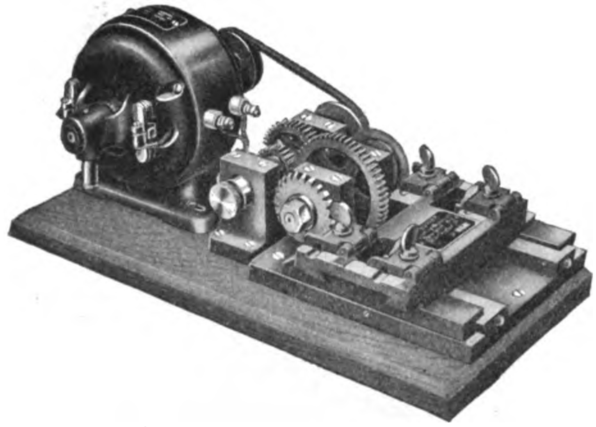
Automatic numbering perforator, made by American Perforator Co., 681 West Jackson boulevard, Chicago, Ill., for numbering many papers at one time, operated by a ⅛ h.p. motor, made by Bodine Electric Co., 564 West Randolph street, Chicago, Ill.



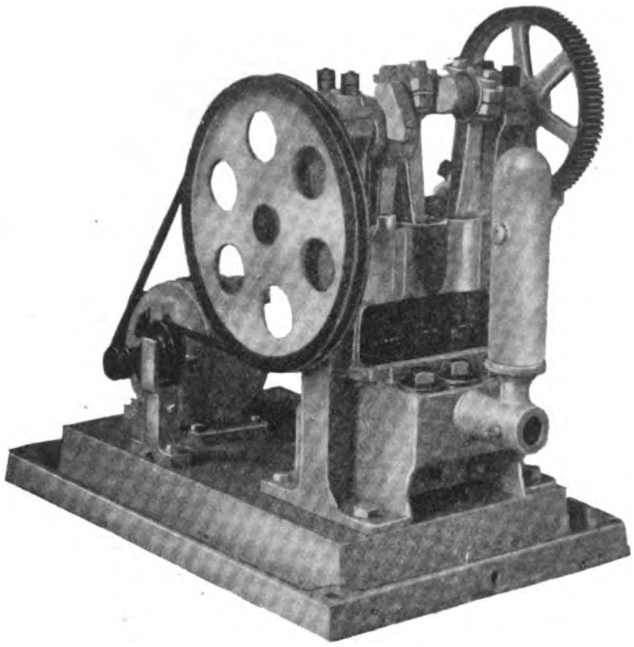
1/7 h.p., 110 volt, 2,800 r.p.m., d.c. motor made by Diehl Mfg. Co., Elizabeth, N. J., belted to Singer family sewing machine.



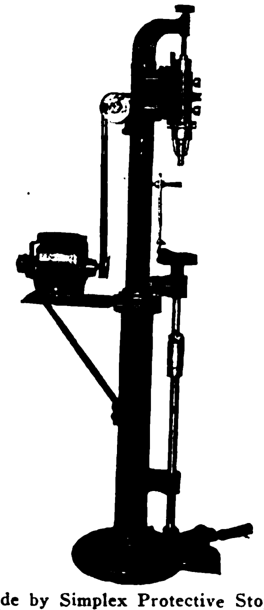
Special application of a ⅛ h.p. motor to a bench drill for light work in factories and machine shops. Drill and motor, made by Ft. Wayne Electric Works, 1612 Broadway, Ft. Wayne, Ind.



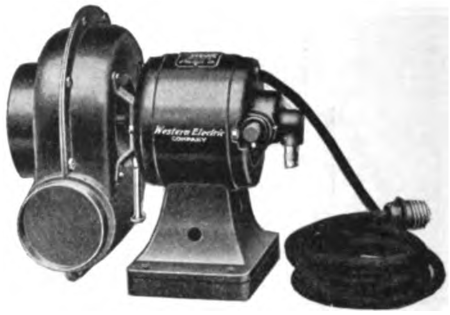
⅛ h.p. motor, made by The Robbins & Myers Co., Springfield, Ohio, belted to a key cutting machine.



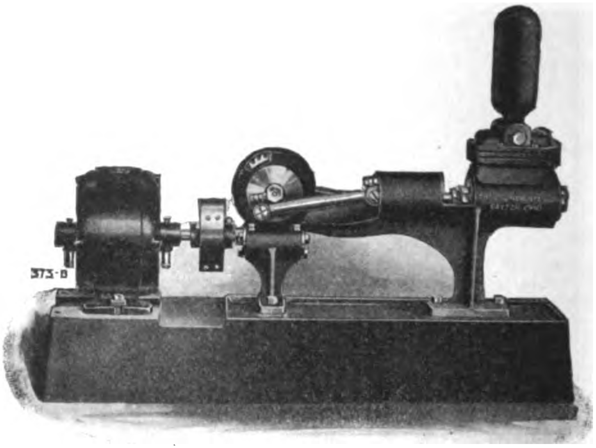
Triplex type, house pump, made by Goulds Mfg. Co., operated by a ⅛ h.p., Westinghouse motor; will fill a 300-gal. tank 150 ft. above ground in less than three hours.



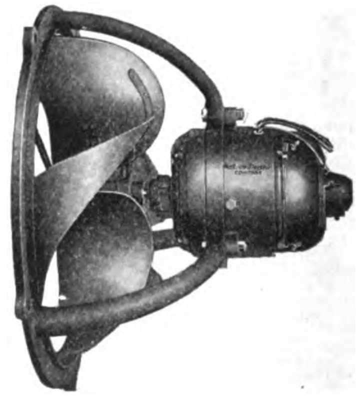
Spinning machine, made by Simplex Protective Stopper Co., for spinning non-refillable attachment in bottles, operated by a 1/6 h.p., 1750 r.p.m., d.c. motor, made by The Robbins & Myers Co., Springfield, Ohio.



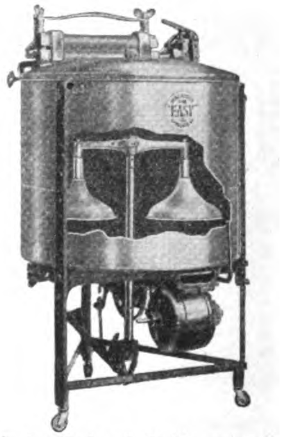
1/6 h.p., 1,150 r.p.m., direct current motor, made by Western Electric Co., 463 West street, New York, operating portable ventilating fan.



G. J. Roberts Co., house pump, operated by a 1/6 h.p., 1,150 r.p.m., 110 volt, 60 cycle, a.c. motor made by The Robbins & Myers Co., Springfield, Ohio.



1/5 h.p., 900 r.p.m., motor, made by Western Electric Co., 463 West street, New York, driving ventilating outfit.



Washing machine, made by Dodge & Zuill, operated by a ⅙ h.p., 1760 r.p.m., 110 volt, 60 cycle, a.c. motor, made by The Robbins & Myers Co., Springfield, Ohio.

CENTRAL STATION MISCELLANY

The Oklahoma Coal Co., of Dewar, Oklahoma, has a central power plant on its premises that furnishes power for twenty mining machines, two mine hoists, one mine fan, and one locomotive. The plant consists of one 312-kva., 2300-volt unit, consisting of a 365 h.p. Ridgway side crank engine and a 250-kw. General Electric type A T B generator. A 625-kva., 2300-volt Westinghouse turbine-alternator will also be installed. A. C. Hatchell is chief engineer of this plant.

Ordinarily one thinks of electricity as being most easily developed by water power, says Bulletin 77 recently issued by the U. S. Bureau of Mines. In a way this is true, but as to whether power can be as easily and cheaply produced in this manner as by steam or gas will of course depend on the initial cost of installation, which, in turn, depends, among other things, upon the following:

1. The mean average flow of water for 12 months.
2. Whether expensive reservoirs have to be constructed.
3. Whether these reservoirs are situated a long distance from the site of the power plant, thus necessitating the construction of long ditches, flumes, tunnels, or pipe lines.
4. Whether expensive dams have to be constructed.

In all the forms of water power that are available, either one or all of the above-mentioned prerequisites have to be given serious consideration, although the cost of installation may be as low as $48 per kilowatt or as high as $400. The cost of hydroelectric power to the consumer may vary from $5 to $60 per kilowatt-year, depending largely on local conditions.

The general safety committee of the New York Edison Co., in a report just filed, records that in the last six months accidents to employees have been reduced 33⅓ per cent. During the months of August, September, October and November, 1914, the operating departments were practically free from accidents. It is interesting to note that most of the accidents are of such a minor nature that the employees seldom miss even a day's work and that only 0 per cent. of the accidents are caused electrically. J. L. Murrie, a safety engineer, has charge of the accident prevention work. The general safety committee is composed of one representative from each department, who also act as chairmen of special field committees. The duty of the field committees is to spread the safety idea and obtain suggestions for improvements in safety methods.

W. S. Murray, electrical engineer of the New Haven road, says: Experience shows that a pound of coal burned under the boilers of a central electric power station and transmitted to an electrical engine will develop twice the drawbar pull at the same speed as if burned in the firebox of a steam locomotive. The maintenance and repair cost on electric locomotives of the straight alternating current type are about one-half of those of steam locomotives of equal weight on drivers. The problem of electrification, then, depends upon the density of traffic in which these economies can be practised. If the schedule of train movements for all roads were the same, then, based upon the number of tons translated, it would be a simple matter to plot a chart which would show two intersecting curves, one representing the savings per annum to be effected by the substitution of electricity for steam, and the other the summation of the costs per annum of interest, depreciation, maintenance, insurance and taxes on electric power plants, inclusive of power house, lines, locomotives and shops, necessary to affect these savings.

The city of Youngstown, Ohio, has entered into contract with the Youngstown & Sharon Street Railway Co., for a street lighting system. The period of the contract is ten years. The system comprises approximately 3200 100-c.p. bracket lights and 316 1000- and 600-c.p. ornamental standard whiteway lights. Installation will begin at once. H. Whitford Jones & Co., of Cleveland, Ohio, who laid out the system and have conducted negotiations for the city will supervise the installation of the new system.

A hydroelectric generating station, has recently been put in operation by the Rochester Railway & Light Co. The total cost of the station, the capacity of which is 4500 kva., was $176,000, making a cost per kilovolt-ampere of $39.10. It is interesting to compare this figure with the average value of $125 per kilowatt recently given by Messrs. Stott, Pigott, and Gorsuck at a meeting of the American Institute of Electrical Engineers. The total cost included the preliminary investigation, reports, cost of building, intake and forebay construction, head works, penstock, tail race, and 3000 feet of underground lead cable for tieing this plant to two other generating stations, as well as the initial and installation cost of the hydraulic and electrical apparatus. This figure, however, does not include any items covering water rights or real estate.

"Hand Firing Soft Coal Under Power-Plant Boilers," just issued by the United States Bureau of Mines, will be found helpful by many central station operatives. The paper, which contains descriptions of methods of firing soft coal under power-plant boilers and of methods of handling fire so as to have the least smoke and to get the most heat from the fuel, seeks to meet the needs of the men, many without a technical education, who are employed in small plants of 1,000 to 2,000 h.p. capacity. For this reason the language used is plain and simple, and technical terms have been avoided as far as possible. Copies of this paper may be obtained by addressing the Director of the Bureau of Mines, Washington, D. C.

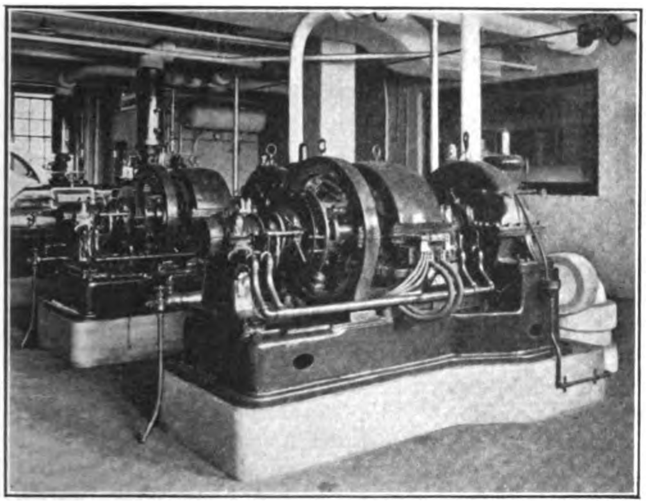
Specifications of All Makes of 1915 Fans

Company	Style of Fan	Type	Size in Inches	Voltage	Current	Frequency in Cycles	No. of Blades	No. of Speeds	Body	Finish
Adams-Bagnall Elec. Co., Cleveland, Ohio	Residence, Desk and bracket	Stationary, Sta. and oscillating	8 12 and 16	100–120	a. c.–d. c.	60	4	2 3 and 2	Pressed metal Cast iron	Gun metal Black enamel
Carleton Co., Boston, Mass.	Residence, Desk and bracket	Stationary and oscillating	6 and 8	6 to 120	Universal		4	3	Die cast	Black enamel
Century Electric Co., St. Louis, Mo.	Residence, Desk and bracket	Stationary and oscillating	12 12 and 16	100–110 100–120	a. c.	40, 50 and 60 25 to 133	4	5 5 and 1	Drawn or pressed steel	Black enamel
Colonial Fan & Motor Co., Warren, Ohio	Residence, Desk and bracket	Stationary and oscillating	8, 12 & 16	110–220	Universal and a. c.–d. c.	60	6 4	3	Drawn steel and Cast iron	Black enamel
Crocker-Wheeler Co., Ampere, N. J.	Residence, Desk and bracket	Stationary	9	110	a. c.–d. c.	60	4	3	Brass	Dark nickel
Dayton Fan & Motor Co., Dayton, Ohio	Residence, Desk and bracket	Stationary, Sta. and oscillating	8 and 12 8, 12 & 16	30–250	a. c.–d. c.	50 and 60 50, 60 & 100	4 and 6 4	3	Cast iron	Black enamel
Diehl Mfg. Co., Elizabeth, N. J.	Residence, Desk and bracket	Stationary and oscillating	8, 12 & 16 12 and 16	100–240	a. c.–d. c.	25–133	4 and 6 4	3	Pressed metal and die cast	Black enamel and dull black
Dilg Mfg. & Trading Co., New York	Residence, Desk and bracket	Stationary Oscillating	10 and 13 10, 13, 16 and 19	Any	a. c.–d. c.	25–133.	4	3	Cast iron	Black enamel and nickel plate
Eck Dynamo & Motor Co. Belleville, N. J.	Residence, Desk and bracket	Stationary and oscillating	8, 12 & 16	Up to 250	a. c.–d. c.	40, 50 & 60	4	3	Cast iron	Black enamel
Emerson Elec. Mfg. Co., St. Louis, Mo.	Residence, Desk and bracket	Stationary and oscillating	12 8, 9, 12 and 16	110–220	a. c.–d. c.	25 to 60 25 to 133	6 4	3 3	Cast iron	Black enamel
Fidelity Electric Co., Lancaster, Pa.	Residence, Desk and bracket	Stationary, Sta. and oscillating	8 12 and 16	110 110–220	Universal a. c.–d. c.	60 25, 40 & 60	4 4	1 3	Cast iron	Black enamel
Fullerton Electric Co., New York	Residence, Desk and bracket	Stationary, Sta. and oscillating	12 and 16	110–220	d. c.		6 4	3 3	Pressed steel	Dull black
General Electric Co., Schenectady, N. Y.	Residence, Desk and bracket	Stationary and oscillating	8, 12 & 16	100–220	a. c.–d. c.	25 to 60 25 to 133	6 4	3 3	Cast iron Drawn metal	Black enamel Marinelacquer
Hamilton Beach Mfg. Co., Racine, Wis.	Residence and Desk and bracket	Stationary	8	Any	a. c.–d. c.		4	8		Nickel
Hunter Fan & Motor Co., New York	Residence and Desk and bracket	Stationary and oscillating	8, 12 & 16	Any	a. c.–d. c.	25 to 133	4	3	Cast iron	Black enamel
Knapp Elec. & Novelty Co., New York	Residence and Desk and bracket	Stationary	8 and 10	6 and 110	a. c.–d. c.	60	4	1 and 2	Cast iron	Black enamel
Manhattan Elec. Supply Co., New York	Residence and Desk and bracket	Stationary and oscillating	8, 12 & 16	110–220	d. c.		4	3	Cast iron	Black enamel
Ercole Marelli & Co., Ltd., New York	Residence, Desk and bracket	Stationary, Sta. and oscillating	10, 12 & 16	Any	a. c.–d. c.		4	2, 3 & 6	Cast iron	Black enamel
Menominee Elec. Mfg. Co. Menominee, Mich.	Residence, Desk and bracket	Stationary and oscillating	8, 12 & 16	110–120	a. c.–d. c.	60	6 4	3	Cast iron and Aluminum	Black enamel and nickel
Peerless Electric Co., Warren, Ohio	Residence, Desk and bracket	Stationary and oscillating	8, 12 & 16	110–220	Universal and a. c.–d. c.	60	6 4	3	Drawn steel and Cast iron	Black enamel
Racine Electric Co., Racine, Wis.	Residence and Desk and bracket	Stationary	8 and 12	110–130	a. c.–d. c.		4	3	Cast iron	Black enamel, black & brass, and nickel
Robbins & Myers Co., Springfield, Ohio	Residence and Desk and bracket	Stationary and oscillating	8, 12 & 16	Any	a. c.–d. c.	25 to 60	4 and 6 4	3	Cast iron and drawn steel	Black enamel
Sprague Electric Works, New York	Desk and bracket	Stationary and oscillating	12 and 16	115 & 230	d. c.		4	3	Cast iron	Black Japan
Storm Wave Fan Co., Chicago, Ill.	Desk	Rotating and rotating-oscillating	10, 12 & 16	Standard			4	3	Cast iron	Black enamel
Western Electric Co., New York	Residence, Desk and bracket	Stationary Sta. and oscillating Oscillating	12 and 16 8, 12 & 16 16	100 to 230	a. c.–d. c.	25 to 60 133	6 4	3 3	Drawn steel	Dull black
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.	Residence, Desk and bracket	Stationary and oscillating	8, 12 & 16	100 to 250	a. c.–d. c.	25 to 60 25 to 133	6 4	3	Drawn steel	Dull black

Boston Y. M. C. A. Lighting and Power Plant

One of the most advanced electric heat and power installations in Boston is that of the new Young Men's Christian Association Building, on Huntington avenue. This 7-story structure is the office headquarters for the organization, and contains the accommodations for athletic training, recreation features of various kinds, school rooms and shops for technical training, which includes courses in electricity. The three upper floor are dormitories.

The steam plant consists of four 125-hp. boilers, manufactured by the Robb Engineering Company, South Framingham, Mass. These furnish steam heat to the building, and also the motive power to the electric generators, which consist of two 80-hp. Ridgway engines each direct connected to a 50-kw. Westinghouse generator operating at 290 r.p.m. and producing 125/250-volt direct current for the three-wire system operating lights and power equipment; and also two 75-kw. Westinghouse direct-current generators driven by turbines, operating at 2,750 r.p.m., and good for 25 per cent. overload.



Turbine driven generator. Y. M. C. A. Building, Boston, Mass.

A notable feature of the boiler room equipment is a forced draft system operated by a 10-hp. Diehl motor, made by the Diehl Mfg. Co., Elizabeth, N. J. A 2.5 motor of Holtzer-Cabot Electric Co., Boston, Mass., manufacture, operates a sump pump below the boiler room floor.

The generator room is large and well lighted, the floor being of concrete laid off in gray and red patterns. Each engine-generator stands on a foundation of solid concrete 15 feet square, which extends through a sub-basement to piling foundations.

The switchboard is of eight panels, 18 feet long, and was furnished by the Trumbull Electric Co., Plainville, Conn. The power leads are carried to the top of the board in 3-in. iron conduits. On the back of the board are Westinghouse Type J field rheostats. There are three busbars, two being regularly used for lighting and the other for power. The arrangement of switch connections permits of the busses to be operated together, or singly, and the generating units can be operated in any combination according to the load.

One panel of the board is provided for each generator. Circuit breakers are installed on each generator lead, of Condit Electric Mfg. Co., Boston, make. Ammeters were furnished by the Weston Electrical Instrument Co., Newark, N. J. On a bracket at the end of the board next the generator panels is a Weston station voltmeter.

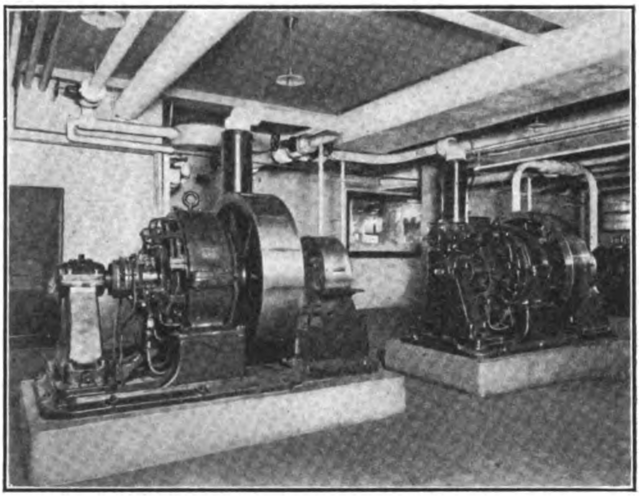
On the central panel, with the main power switch and ground detector, is installed a Weston voltmeter and ammeter and two Sangamo totalizing watt-hour meters, one for lighting and for power. The latter instruments are manufactured by the Sangamo Electric Co., Springfield, Ills.

A panel for supply of energy to the motors in the building carries 8 switches, dividing the supply into the various portions of the building.

There are two lighting panels on the board, with six and eight switches, respectively. All the switches are of Trumbull manufacture.

The underground distribution system feeding the various departments is carried in Orangeburg fibre conduit, made by the Fibre Conduit Co., Orangeburg, N. Y. Wire called for in the specifications included the Simplex, American Steel & Wire Co., Diamond Rubber Co. and Electric Cable Co. products. Conduit required was Galvaduct, Sheraduct, X-Ray or Galvanite. Outlet fittings are of Pratt-Chuck Co., Frankfort, N. Y., manufacture.

Water is supplied to the building from a 400-ft. artesian well and is pumped by a 36 by 12-in. steam pump to a 78,000-gal. swimming pool at a distance of 250 feet from the pump. To draw the water from the pool a 10-hp. Holtzer-Cabot motor operates a Worthington rotary pump which lifts the water to a tank on the roof, whence it flows to the plumbing by gravity, for flushing purposes.



Two 50-kw., Westinghouse generators direct connected to Ridgway engines. Y. M. C. A. heating-power station, Boston, Mass.

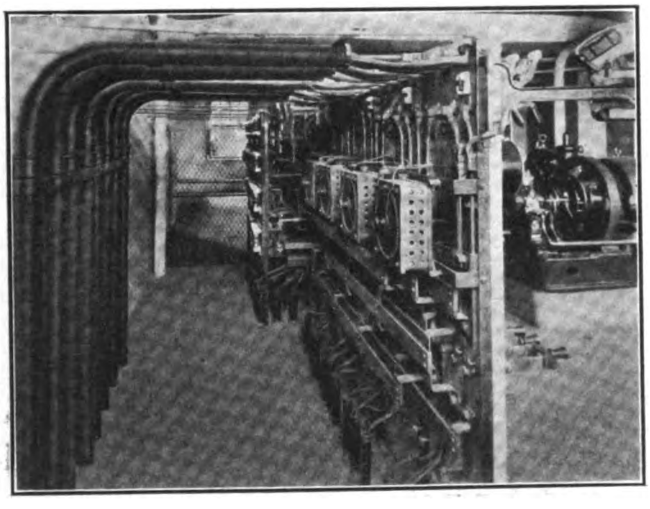
Ventilation for the building is provided by four Webster Standard air washing machines, from Warren Webster & Co., Camden, N. J. Three motors are required to operate each "washer," one operating a circulating fan, of 9.5 to 12.4-hp., a motor of 6.5 hp. on the exhaust fan, and one of 3-hp. to drive a pump which takes the water from the reservoir at the bottom of the apparatus and returns it to a shower head above. All the motors and fans are of the B. F. Sturtevant Co., Boston, Mass., manufacture.

Bates Hall, the large auditorium, is ventilated by an indirect system, two 3.5-hp. Sturtevant motors being in service to operate fans for expulsion and circulation of air. Both motors have Cutler-Hammer variable-speed control.

There are also two air-filtering systems, each operated by a 9.5-hp. Sturtevant motor, direct connected to a blower of the same make. In vent houses on the roof are 7 exhaust fans operated by 4.5-hp. Sturtevant motors controlled by self-starters of Cutler-Hammer Mfg. Co., Milwaukee, make. The exhaust of each division of the building is controlled separately from the power panel on the main switchboard in the generator room.

Thirty time clocks manufactured by the Standard Electric Time Co., Springfield, Mass., are installed in various parts of the building. A bell system, watchman's clocks, and fire alarm signal system, all by the Holtzer-Cabot Electric Co., Boston, Mass., are installed. In connection, a 1/4-kw. Holtzer-Cabot motor-generator set supplies 15-volt energy for their operation. Near this unit is located the low-tension switchboard for the control of the various systems, and the circuits are all tied in within a steel cabinet near by. A 7-cell storage battery furnished by the American Storage Battery Co., Cambridge, Mass., is installed in connection with the 15-volt system. The switchboard and relay are by the Simplex Electric Heating Co., Boston, and the motor-generator is controlled through a Cutler-Hammer starting box.

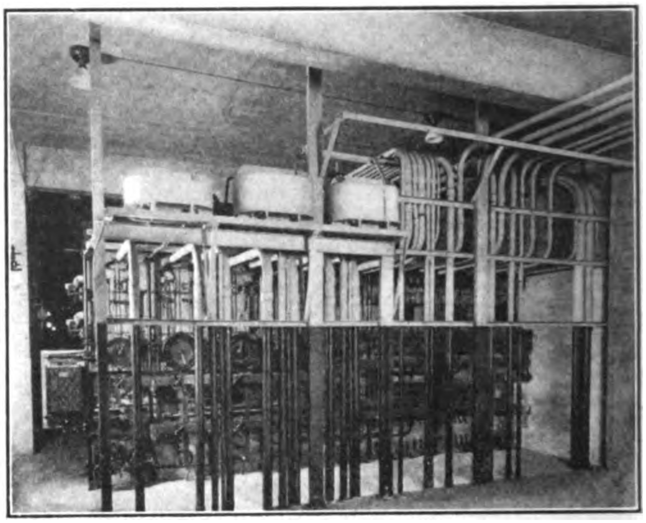
There are three passenger elevators, two connecting the six floors from the ground floor up, and one connecting all floors and basement. Each is operated by a 30-hp. motor, the elevator and power equipment being furnished by the Otis Elevator Co., South Boston, Mass. Connection is made from the power panel on the main switchboard to a secondary board in the monitor housing the motors. From this secondary board all power leads are run in exposed conduits, through a style F. A. controller to the motor, which is worm-geared to the drum. Condulets of Crouse-Hinds manufacture, of Syracuse, N. Y., are used extensively throughout the building.



Back view of switchboard, Y. M. C. A. heating-power station, Boston, Mass.

There are about 300 Hixon lighting panels for the control and fuses of circuits supplying the various individual rooms and corridors. These cabinets are of slate board and sides, with wooden door and frame. The Hixon Electric Co., 246 Summer street. Boston, were the contractors for the installation.

The building is noteworthy for its excellent lighting equipment. One hundred watt Mazda lamps are used in abundance. The lighting of the main lobby is by means of two handsome bronze chandeliers, each carrying thirteen 100-watt mazda half-frosted units, and there are several 3-lamp bronze wall fixtures each of 100-watt lamps. The outer vestibule is equipped with four chandeliers each carrying five 60-watt lamps, and there are four 3-lamp 100-watt wall brackets. All glass shades are of holophane type, made by the Holophane works of General Electric Co., Cleveland, Ohio.



Back view of switchboard, city hall station, Boston, Mass.

The main billiard room, containing six tables, is lighted by sixteen 100-watt units in holophane glass, installed singly on bronze conduit about 3 feet below the ceiling and 10 feet above the floor. Two boys' play rooms are similarly lighted, on the flood-light principle. The corridors are lighted with 60-watt half-frosted lamps in holophane shades, installed close to the ceiling.

Libraries, educational rooms, and offices are all equipped with 100-watt half-frosted mazdas, similarly shaded, and the bedrooms are lighted by 25 and 40-watt units. In the gymnasium are twenty 500-watt half-frosted mazdas 35 feet above the floor, each lamp with a 27-in. shallow enameled metal reflector.

Russell & Stoll Co., New York, receptacles and plugs for two stereopticons are installed in the auditorium. The stage foot-light reflectors are made by the Wheeler Reflector Co., Boston, Mass.

Plugs throughout are of the Hubbell flush type, made by Harvey Hubbell, Bridgeport, Conn. Lamp circuit switches are Diamond H. or H. & H. type.

In the photographic laboratory of the Camera Club is installed a 110-volt Cooper-Hewitt enlarging camera. Sturtevant motor-driven fans provide ventilation for the several dark rooms.

The machine shop of the Educational Department is equipped with a 3-hp. Sturtevant motored air-compressor, a 15-hp. motor driving lathes, planers, shapers, and drills, and one of 10 hp. driving woodworking machinery, consisting of lathes, a band saw, and a jig saw.

In the laundry is a washing machine, also two driers, each motor driven. All this apparatus was supplied by the American Laundry Machinery Co.

On the roof of the building, facing citywards, is a large illuminated sign consisting of the letters Y M C A, each letter being 8 ft. high, and containing in all 216 10-watt mazda lamps installed on the white enameled face of the sign, strongly braced with structural steel.

George B. Buxton is the operating engineer of the whole plant, and has long been with the association.

Another noteworthy Boston installation is that of the new City Hall Annex which was completed early in the present winter. Here are two 125-kw. engine-driven generators and one of 62.5-kw., all furnished by the Ridgway Dynamo & Engine Co., Ridgway, N. J. The engine ratings are 220 and 90-hp. respectively. Energy is generated, direct current, at 230 volts, the distribution system being of the 3-wire type. A 10-kw. General Electric constant-current generator, direct connected to a 16-hp. General Electric marine engine, supplies 110-volt energy to a two-wire system, for extra service. Three 250-hp. Babcock & Wilcox boilers are installed, for heating and engine propulsion.

The switchboard and switches are of Trumbull Electric Mfg. Co. make. The conduit was supplied by the National Metal Molding Co., Pittsburg, Pa., the wire by the American Steel & Wire Co., New York, and the panels, lighting switches and other fittings by the Crouse-Hinds Co., Syracuse, N. Y. Thomas W. Byrne, Boston, Mass., was the engineer in charge of construction, and the Hixon Electric Co., Boston, were the wiring contractors.

This plant furnishes power and lighting to the City Hall as well as the new annex.

New York Fire Alarm System

At a meeting of the New York Electrical Society, held on February 17, at the Engineering Societies Building, New York, Putnam A. Bates, electrical engineer of the New York Fire Department, gave an interesting talk on the fire alarm system of New York City, tracing the history of the department from the time of the old lookout towers up to the present system. Mr. Bates made the statement that the fire alarm telegraph system of the city is in a very unreliable condition at the present time, due in large measure to the fact that much of the installation dates back for about forty years, the plant of 1870 being the basis of the present system. He said that as a large part of the system consists of overhead wires, storms such as the one that occurred in March, 1914, cause an inefficiency that is deplorable. After that storm practically the entire system was demoralized, many of the circuits being completely out of commission for as long a period as 30 days. This condition necessitated the organization of patrols—firemen detailed to patrol the streets and watch for fires—as it was impossible to send in alarms from any of the street boxes. He added that construction work taking place in connection with the new subways handicaps the system greatly, as many of the cables (principally in the Borough of Manhattan) are underground and have been in service since 1870. These cables are in wretched condition and the wires practically useless for service, but owing to lack of funds they have had to answer as best they could.

To-day, the fire alarm telegraph system of New York consists of 4,500 miles of circuits, and 45 central stations. There are 300 fire fighting companies, and 5,000 enrolled men. After a study of the existing conditions, Mr. Bates says that the fire commissioner has decided that an entire new system is not only necessary but imperative. A fund therefore of approximately $1,000,000 is to be asked for, for the purpose of installing an entire new system. In the Borough of Manhattan and most of the Bronx, it is proposed to have the wires in ducts underground. One-third of the Brooklyn system is to consist of underground circuits, the balance, owing to the sections not being built up, is to remain as at present—the wires being carried overhead. A new type of street box mounted on a special pole, and provided with an incandescent lamp with red globe has been designed. In the Borough of Manhattan alone it is suggested that 1,650 of these street stations be installed, more than twice the number now in use. This means a street station at every fourth block. The plans have not, however, developed sufficiently at the present time to make any statement as to the details of the new system.

At the conclusion of Mr. Bates' address a demonstration was given of the relative values of incandescent, vapor, and arc lights in connection with moving picture work, many directors of prominent moving picture companies and their camera men participating.

Washing Machine Costs

It is stated as a fact by C. D. Lindsey, of the Western Electric Co., that 90 per cent. of the bed and table linen and 75 per cent. of other articles are worn out not by actual wear, but rather by the tear and rub on the clothes when washed on the old-fashioned and now antiquated washboard. When washed in a modern electric washing machine, not a thread of even the finest of laces is ever broken and the clothes will last a great deal longer than when washed by any other method. The expense of this washboard rub and tear in the average family of five, will amount to about $80 per year, or $400 in five years. Furthermore, for the housewife who does her own work or employs only one maid, there is the additional expense of a laundress. A good laundress is hard to get, and even then one has to pay $1.50 or $1.60 per day and provide her with one or two meals, a total of about $2 per day, or $100 per year, so that in five years the amount involved is something like $500. Thus, a family that is not equipped with one of these electric washers is spending about $900 in five years.

The initial investment for the washing machine is $85. At 2 cents per hour it costs about $3 per year for current to operate it. Figuring the cost of the washer, interest on investment, possible repairs, etc., an initial investment of less than $100 would be required for the first year, which, with a cost of $5 for each of the next succeeding four years, would make a total cost of $120 for the five years. This figure is approximate, and in the majority of cases the cost will run much lower.

Assuming for argument's sake, that one-half of the $400 wear and tear depreciation on the linen and clothing of the average family of five for five years is due to the discarding of old styles and their replacing with up-to-date pieces, we have $700, representing the cost of a laundress and the depreciation due to the wear and tear of the washboard, as compared with $120 for the family which has a washing machine, or a net saving of $580 in five years.

The Allied Electric Co., 105 North Clark street, Chicago, conducts its export business under the name of the Storm Wave Fan Co. One of its products is the double blade fan shown in the New Products section of this issue.

TECHNICAL SCIENTIFIC — FINDINGS — PHILOSOPHICAL THEORETICAL

A vessel that passes through the Panama Canal from the Atlantic to the Pacific enters the approach channel in Limon Bay, which extends to Gatun, a distance of about 7 miles. At Gaton it enters a series of three locks in flight and is raised 85 ft. to the level of Gatun Lake. It may then steam at full speed through the channel in this lake, for a distance of 24 miles, to Bas Obispo, where it enters the Culebra Cut, which has a length of 9 miles. At Pedro Miguel it enters a lock and is lowered 30 ft., and then passes through Miraflores Lake for a distance of 1½ miles until it reaches Miraflores, where it will be lowered 55 ft. through two locks, to the sea level, finally passing out into the Pacific through an 8½-mile channel. Ships are towed through the locks by electric locomotives designed and installed for that specific purpose.

A new white metal alloy that greatly resembles silver, and withstands atmospheric conditions to a great extent, is announced from Washington, D. C. It is suitable for the manufacture of goods which are to be silver plated. To make it, 8½ pounds of nickel are melted with a flux of silica, 20 pounds of copper are added gradually and mixed, and then 20 pounds more copper are added. Then 5 pounds of zinc are plunged beneath the molten metal, which is stirred rapidly till the whole is melted. Two and one-half pounds tin and one pound lead are added last to the liquid. Stir and heat up to 1700° F., then pour into ingot moulds.

The American Ambulance Hospital in Paris is equipped with all the approved electrical devices now used by the medical profession to alleviate human ailments. This hospital is the only army hospital in Paris, all the others being located at some distance from the city in order to spare the city from the sights and moral effect that follow in the wake of the distressing injuries caused by warfare where shrapnel is freely used. This hospital is in charge of American surgeons, nurses, and assistants, and is supported by American contributions. It has a large fleet of Ford ambulances, the bodies of which are constructed out of the packing case in which the vehicle was shipped from America. They will hold two wounded men, lying down, and four seated. This hospital treats all wounded soldiers regardless of their nationality or which side they are on.

A new powerful searchlight is undergoing test at the New York Navy Yard, in which high efficiency is obtained by using a greatly concentrated arc light. In the new searchlight the area of the light source is even smaller than heretofore, because the electrodes are much smaller, and they are protected from rapid combustion by a cooling stream of alcohol vapor. The alcohol vapor confines the illumination to the tip of the positive electrode, which hollows out into a crater filled with incandescent fumes, backed with white-hot carbon. The small spot of intense brilliancy approaches more closely to the theoretical point of light which is necessary to secure a perfectly parallel beam. The strength of the beam of the new lamp is about six times as great as that of the old. The alcohol vapor is generated by an electric resistor. To obtain a uniform bathing of the electrodes in the vapor, they are rotated.

Late information from Germany is to the effect that alcohol and benzol are the fuels now used almost exclusively by the government cars of all descriptions, and that the only motors that absolutely require gasoline are those in the fast aeroplanes. This has released the pressure on the supply of gasoline, and the embargo placed on this fuel at the start of the war has been raised, so that private owners, at least those who have been able to retain their cars, find no difficulty in getting supplies most anywhere. Benzol and alcohol are used either separately, or mixed, and there are several carbureters in use in Germany that will handle these fuels satisfactorily.

The history of platinum and its by-metals during the past twenty years has been a varied, and, at intervals, a stormy one. About eighteen years ago, its price was as low as $6 a troy ounce. So greatly has the demand for it increased in recent years that the price to-day is between $43 and $44 a troy ounce. There has been an endless endeavor on the part of chemists and research laboratories to replace platinum, but the fact remains that there is as yet no substitute that embodies all the qualities of this metal. It is preëminent among the precious metals, having all the noble qualities of gold, and excelling it in many respects.

Hans P. Molander, of Tacoma, Washington, is reported to have invented a wave motor that gathers in the energy let loose by ocean waves. In this machine the clutch is constructed in such a way that when the paddle arms are swung out by the receding waters it drives the power shaft, and when the waters swing the same paddle back in with the incoming waters the same power shaft is still made to turn in the same direction as before. There is said to be no dead centre on this machine, for every stroke of the paddles no matter how long or how short, transmit power to the power shaft.

In 1849 transcontinental travel consumed 5 months by stage coach. In 1859, by sailing vessel around Cape Horn it required 3 months to reach San Francisco from New York. Ten years later the railway reduced the distance to 20 days. The opening of the Panama Canal in 1914, made it possible to do the journey in 16 days by steamship, while the beginning of 1915 shows a railway record of 71 hours and 27 minutes, with an average time of 90 hours. By transcontinental telephone line a man's voice and personality reach the far end in 1/15 of a second.

High Tension Materials and Fittings

(HIGH TENSION SERIES—ARTICLE NO. 2)

The materials used in connection with the transmission and distribution of high tension current were mentioned in the previous article, and a number of the devices mentioned were illustrated. Additional illustrations of these devices are included in this article.

The energy is conveyed by wires carried on poles or towers by means of brackets, arms, and pins, and insulated by porcelain insulators. Due to atmospheric phenomena, which threaten the continuity of service, the lines are protected by choke-coils, lightning arresters, fuses, disconnecting switches, and grounding devices.

As the reliability of a high tension transmission and distribution line depends largely upon the insulators, a brief description of the insulators in most common use for high tension systems is included in this article, together with a number of illustrations. The other devices mentioned will be taken up in the next article to appear in the April number.

INSULATORS

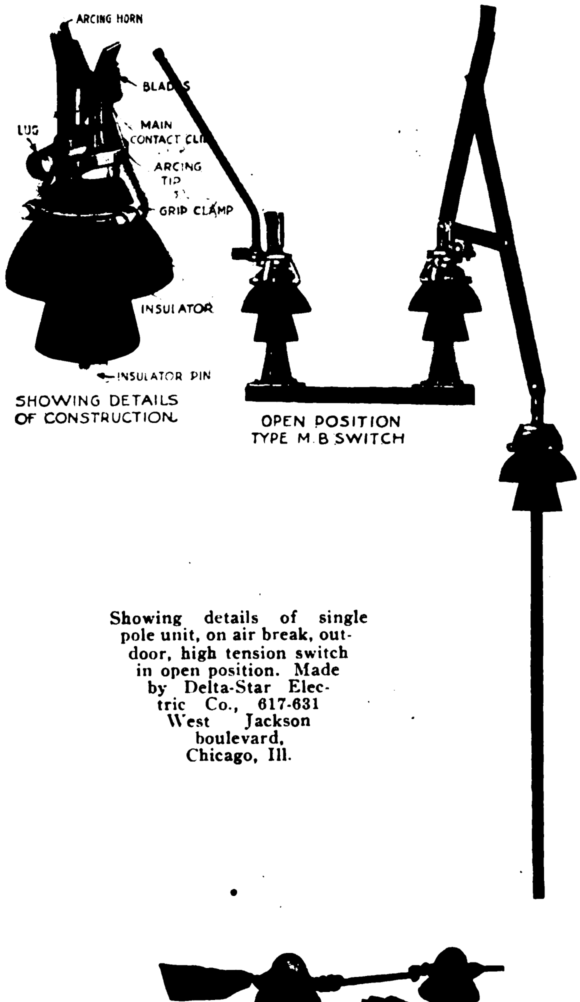
The manufacturers of porcelain insulators have developed their processes so as to take care of the large variety of shapes called for, and the methods of manufacture and the principles of design are now practically standardized for the larger proportion of transmission line insulators. The designer of porcelain insulators must keep the parts proportioned in accordance with the voltage they are to carry, so as to prevent a direct flash from the line wire to the support, or leakage across the surface from the line to the pin. Also, a compromise must be made on the several elements that produce mechanical strength, dielectric strength, flash-over, and surface resistance, as the operating conditions on different lines vary and require widely different relative proportions of these elements.

Transmission insulators may be divided into three classes: One-piece, for voltages up to 20,000; multi-part, for voltages up to 80,000, and suspension insulators for all voltages above 80,000. More often, however, the one-piece and the multi-part insulators are spoken of as pin type insulators. All standard high-tension insulators are usually given a mahogany glaze finish, but other colors may be had when specified.

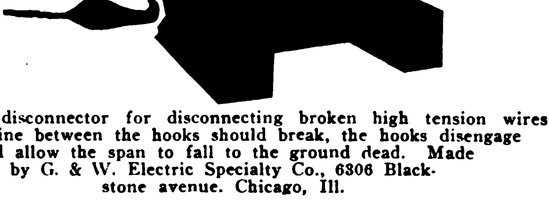
The specifications for one-piece insulators should itemize the tests for performance, as, leakage distance, striking distance, dry test voltage, rain test voltage, and working voltage the insulators should withstand, size of pin holes, and the manner in which they are to be applied.

The specifications for multi-part insulators should itemize the tests for performance and specify in detail the manner in which they are to be applied. For dry flash-over 2½ to 3 times the rated line voltage should be specified, for wet flash over, 1½ to 2 times the rated line voltage, and a puncture test of usually 75 per cent. of the full rated line voltage, applied to the different shells separately before assembling. The multi-part insulator is limited to potentials of approximately 80,000 volts, as above this voltage the difficulty and cost of manufacture of such insulators bring out the advantage of the suspended insulator with its greater flexibility for varying conditions.

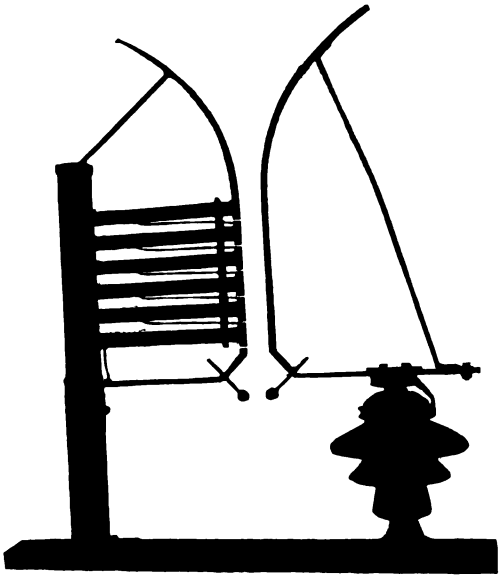
The most popular form of suspension insulator consists of a one-piece porcelain disc having concentric circular ribs or petticoats on the bottom or under surface, a metal cap cemented on a projecting head with a center pin cemented into the hole in the head of the disc. The suspension insulator's great advantage over the pin type (including one-piece and multi-part), is that it is electrically more efficient and stronger mechanically. Furthermore, the number of discs used in suspension depends upon the line voltage—the higher the voltage the larger the number of discs necessary. By adding additional discs, insulators used for certain specified voltages can be used for higher voltages. It is the suspension system of supporting and insulating power circuit conductors that has made possible electric transmission at voltages far above the capacity of the old type of lines insulated with pin type insulators.



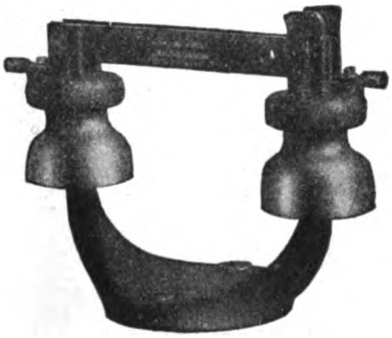
Showing details of single pole unit, on air break, outdoor, high tension switch in open position. Made by Delta-Star Electric Co., 617-631 West Jackson boulevard, Chicago, Ill.



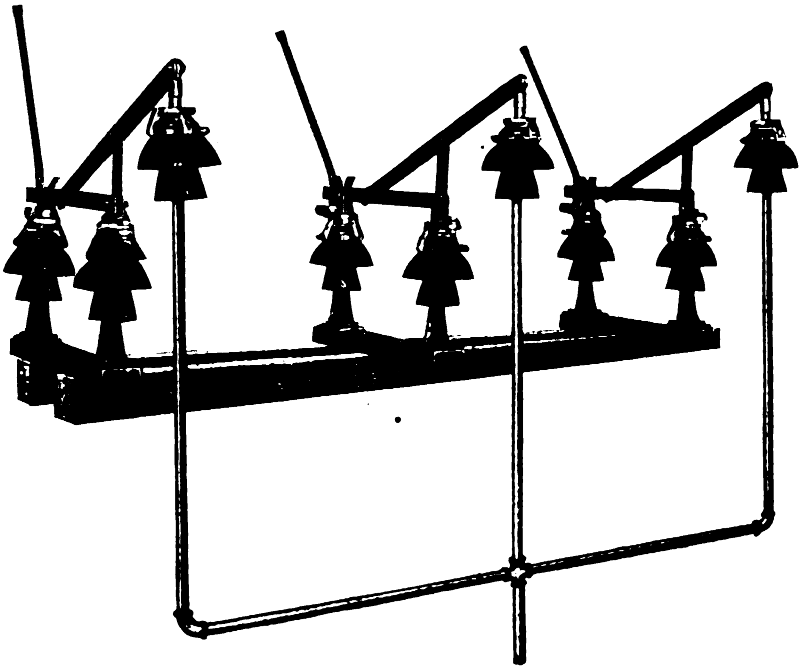
Safety line-disconnector for disconnecting broken high tension wires. If the line between the hooks should break, the hooks disengage and allow the span to fall to the ground dead. Made by G. & W. Electric Specialty Co., 6306 Blackstone avenue. Chicago, Ill.



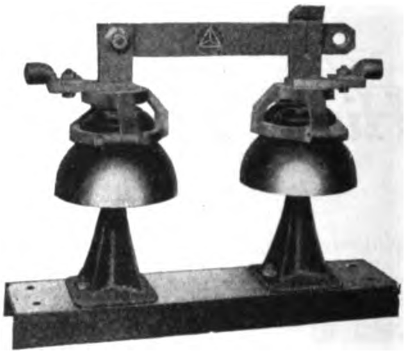
Automatic, resistance, horn arrester for use on circuits of from 11,000 to 66,000 volts; consists of a horn gap and a number of resistance units so arranged that as the current rises up the horns the resistance is automatically cut in step by step into the circuit. Made by Schweitzer & Conrad, 1770-1774 Wilson avenue, Chicago, Ill.



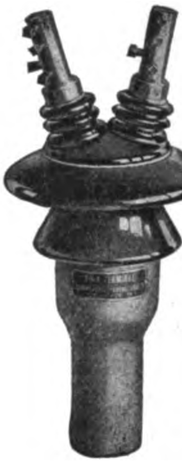
6,600-66,000 volt, disconnecting switch for indoor or outdoor use; insulators cemented to a "U" shaped iron support for securing to station wall or other support. Made by Delta-Star Electric Co., 617-631 West Jackson boulevard, Chicago, Ill.



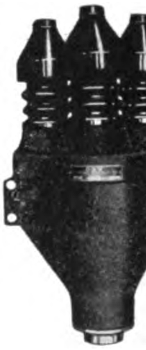
22,000 volt, 300 ampere, three pole, poletop switch for controlling loaded circuits. Made by Delta-Star Electric Co., 617-631 West Jackson **boulevard, Chicago, Ill.**



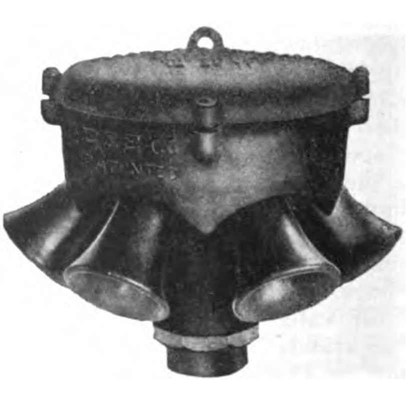
6,600-66,000 disconnecting switch with steel base; insulators cemented to malleable iron flat base pins which are in turn mounted on a channel iron base. Made by Delta-Star Electric Co., 617-631 West Jackson boulevard, Chicago, Ill.



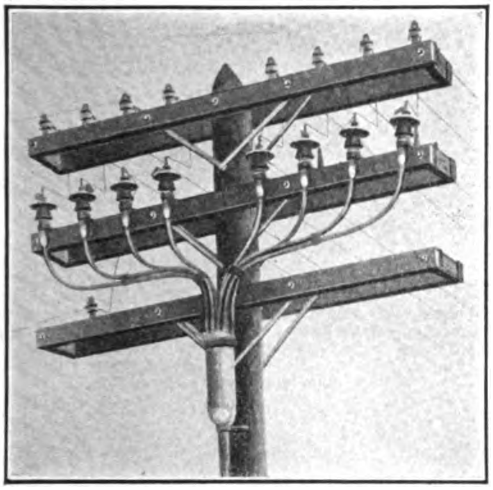
Duplex, series arc terminal for 10,000 volt service, for either two single conductor arc cables or one duplex cable; intended for the use of one or two lamps in series. Made by Standard Underground Cable Co., Westinghouse Building, Pittsburgh, Pa.



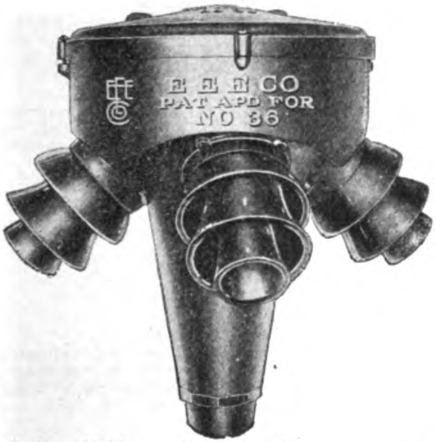
Three-conductor pot head for 6,600 volt outdoor service. Made by G. & W. Electric Specialty Co., 6306 Blackstone avenue, Chicago, Ill.



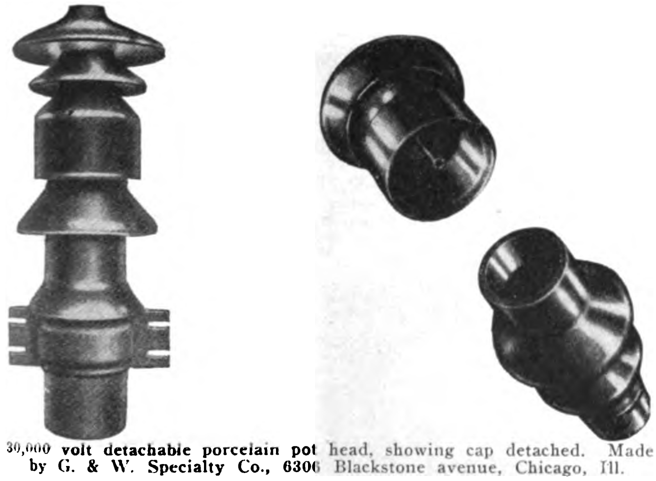
Four-conductor, cable end bell for outside service for voltages up to 13,200, arranged to screw on iron pipe and provided with supports for pole mounting. Made by Electrical Engineers Equipment Co., 711 West Meridian street, Chicago, Ill.



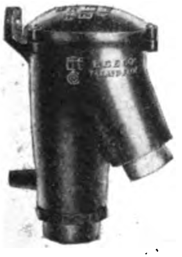
Showing eight, 15,000 volt, multi-unit, open air terminals connected to eight-conductor cable. Made by Standard Underground Cable Co., Westinghouse Building, Pittsburgh, Pa.



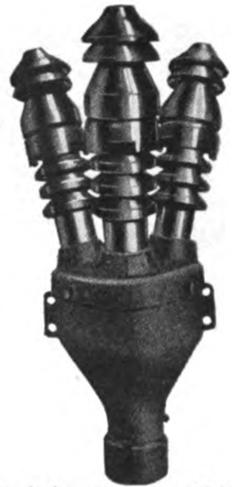
Cable end bell for outside service for voltages up to 33,000, arranged to screw on iron pipe and provided with supports for pole mounting. Electrical Engineers Equipment Co., 711 West Meridian street, Chicago, Ill.



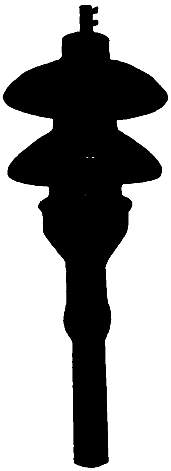
30,000 volt detachable porcelain pot head, showing cap detached. Made by G. & W. Specialty Co., 6306 Blackstone avenue, Chicago, Ill.



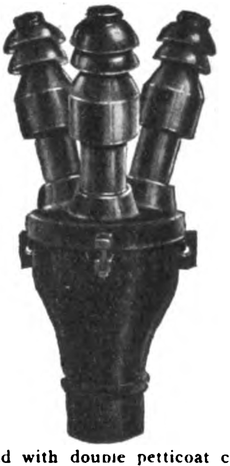
Single conductor, cable end bell for outside service for voltages up to 6,600, a.c. and d.c. circuits; arranged for mounting on iron pipe and provided with supports for pole mounting. Made by Electrical Engineers Equipment Co., 711 West Meridian street, Chicago, Ill.



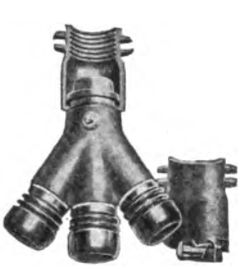
Three-conductor pot head for 10,000 to 15,000 volt outdoor service, with petticoat tubes. Made by G. & W. Electric Specialty Co., 6306 Blackstone avenue, Chicago, Ill.



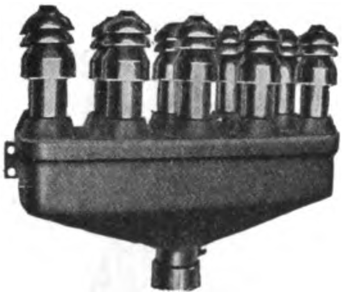
25,000 volt, open air terminal attached to short stub of cable. Made by Standard Underground Cable Co., Westinghouse Building, Pittsburgh, Pa.



Three-conductor pot head with double petticoat caps, for 6,600 volt outdoor service. Made by G. & W. Electric Specialty Co., 6306 Blackstone avenue, Chicago, Ill.

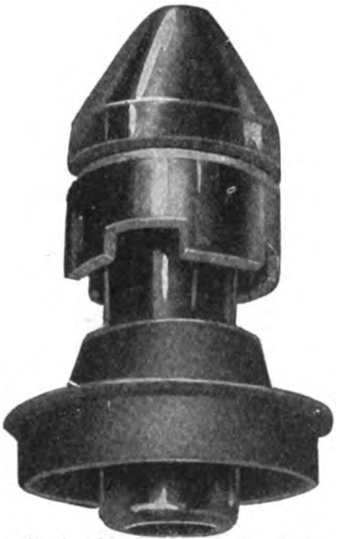


Inverted type, three-conductor, open air terminal with clamps, for steel armored cable, for voltages over 25,000. Made by Standard Underground Cable Co., Westinghouse Building, Pittsburgh, Pa.

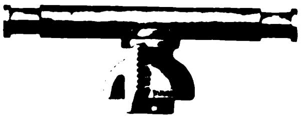


Ten-conductor pot head for inside and outside use, 13,500 volts for station work, 6,600 volts for outside work. Made by G. & W. Electric Co., 6306 Blackstone avenue, Chicago, Ill.

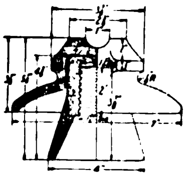
Inverted 40,000 volt, open air terminal for wiped soldered joint connection, particularly suitable for cables running down poles or shafts, or for cables running up poles and turned downward at top of pole. Made by Standard Underground Cable Co., Westinghouse Building, Pittsburgh, Pa.



Single-conductor pot head, with adapter for top of iron pole, with cable run inside of pole; capacity, 15,000 volts, 1,200 amperes. Made by G. & W. Electric Specialty Co., 6306 Blackstone avenue, Chicago, Ill.



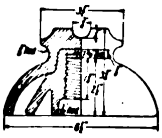
6,600 volt porcelain fuse holder and cut-out; dry test voltage 60,000, rain test voltage 45,000; leakage distance 11 in., striking distance 4 in. Made by The Pittsburg High Voltage Insulator Co., Derry, Pa.



23,000 volt, pin type, porcelain insulator; dry test voltage 70,000, rain test voltage 45,000; leakage distance 10 in., striking distance 3 3/16 inches. Made by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

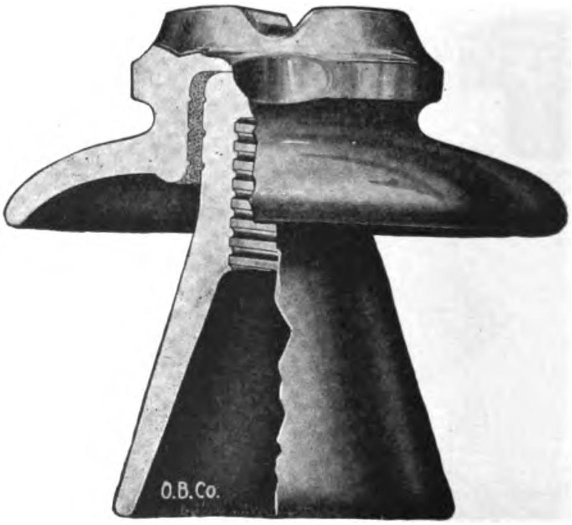
Transposition porcelain insulator for telephone, telegraph and electric light service; dry test voltage 43,000, rain test voltage 28,000, size of pin hole, 1 in.; leakage distance 2⅛ in.; striking distance 1⅛ in. Made by The Pittsburg High Voltage Insulator Co., Derry, Pa.

4,000 volt deep groove, double petticoat, pin type, porcelain insulator; leakage surface 3¼ in., arcing distance, wet, ¾ inch, size of pin hole, one inch. Made by The Ohio Brass Co., Mansfield, Ohio.



23,000 volt, pin type, porcelain insulator; dry test voltage 80,000, rain test voltage 43,000; leakage distance 11½ in., striking distance 2⅝ inches. Made by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

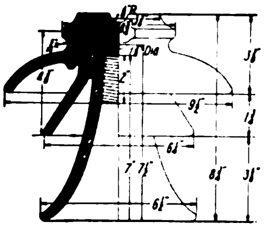
6,600 volt pin type porcelain cable insulator; dry test voltage 40,000, rain test voltage 22,000; leakage distance 5¼ in., striking distance 1⅛ in.; size of pin hole 1 in. Made by The Pittsburg High Voltage Insulator Co., Derry, Pa.



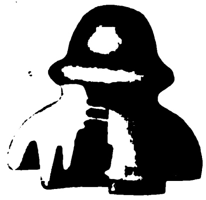
27,000 volt, pin type, porcelain insulator; test voltage 80,000; leakage surface 13 in., arcing distance, wet, 3½ in., size of pin hole 1⅜ inch. Made by The Ohio Brass Co., Mansfield, Ohio.

11,000 volt, pin type, porcelain insulator for cable; test voltage 40,000; leakage surface 4¼ in., arcing distance, wet, 1½ inch. Made by The Ohio Brass Co., Mansfield, Ohio.

Two-piece, glazed joint, 27,000 volt, porcelain pin type insulator; dry test voltage 80,000, rain test voltage 48,000; leakage distance 12½ in., striking distance 3¼ in., size of pin hole 1⅜ in., Made by The Pittsburg High Voltage Insulator Co., Derry, Pa.

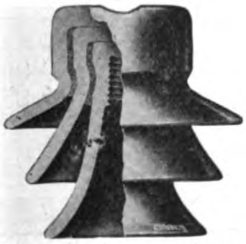


45,000 volt, pin type, porcelain insulator; dry test voltage 110,000, rain test voltage 75,000; leakage distance 24 in., striking distance 6⅛ inches. Made by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

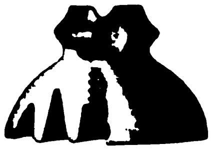


11,000 volt pin type porcelain insulator; dry test voltage 50,000, rain test voltage 30,000; leakage distance 6½ in., striking distance 1⅝ in., size of pin hole 1 in. Made by The Pittsburg High Voltage Insulator Co, Derry, Pa.

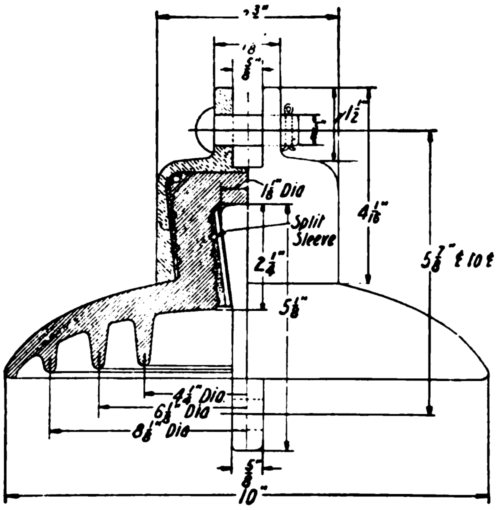
6,600 volt porcelain insulator; leakage surface 3¾ in., arcing distance, wet, 1¼ in., size of pin hole, one inch. Made by The Ohio Brass Co., Mansfield. Ohio.



45,000 volt porcelain pin type insulator, used mostly for switch work; dry test voltage 110,000, rain test voltage 80,000, leakage distance 28 in., striking distance 7 in., size of pin hole, 1⅜ inch. Made by The Pittsburg High Voltage Insulator Co., Derry, Pa.

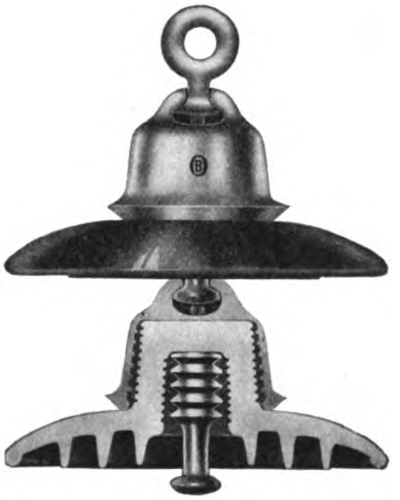


23,000 volt pin type porcelain insulator; dry test voltage 70,000, rain test voltage 43,000; leakage distance 12½ in., striking distance 2⅝ in., size of pin hole 1 in. Made by The Pittsburg High Voltage Insulator Co., Derry, Pa.

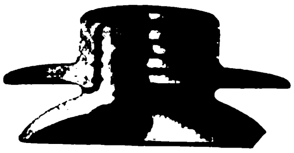


18,000 volt, suspension type, porcelain insulator; dry test voltage 85,000, rain test voltage 55,000; leakage distance 12¼ in., striking distance 5¼ inches. Made by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

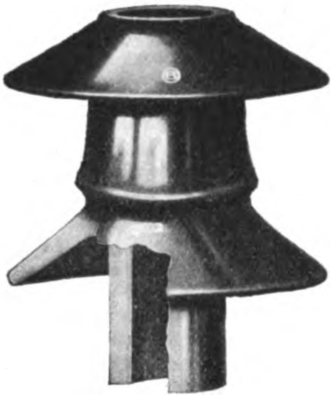
11,000 volt porcelain suspension insulator with metal cap and hook connecting bolt; dry test voltage 65,000, rain test voltage 40,000; leakage distance 7 in., striking distance 3½ inches. Made by The Pittsburg High Voltage Insulator Co., Derry, Pa.



Suspension type porcelain insulator, showing two units connected, lower unit in section. Furnished in from one to six units. Made by The Ohio Brass Co., Mansfield, Ohio.

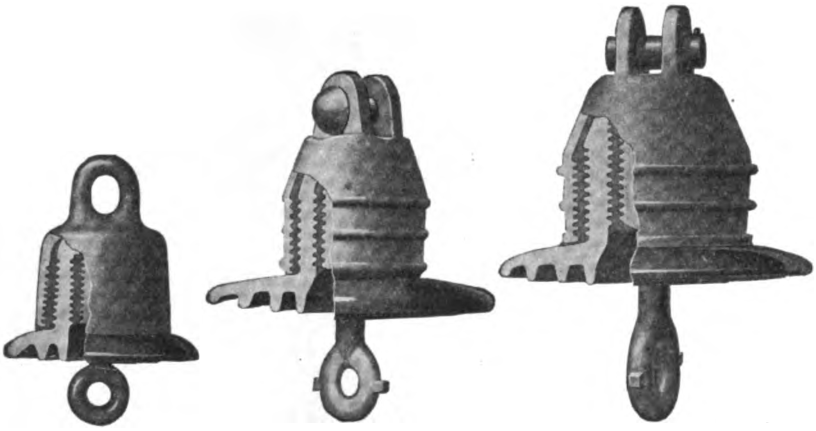


11,000 volt, suspension type, porcelain catenary insulator; dry test voltage 100,000, rain test voltage 70,000; leakage distance 17 in., striking distance 6½ inches. Made by The Pittsburg High Voltage Insulator Co., Derry, Pa.

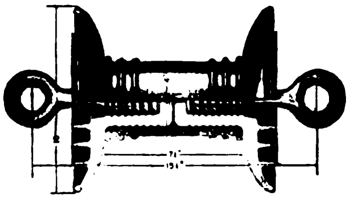


35,000 volt porcelain strain insulator, pin type; test voltage 90,000; leakage surface 10 in., arcing distance, wet, 3¼ in., minimum dia. of pin hole, 2 3/16 inches. Made by The Ohio Brass Co., Mansfield, Ohio.

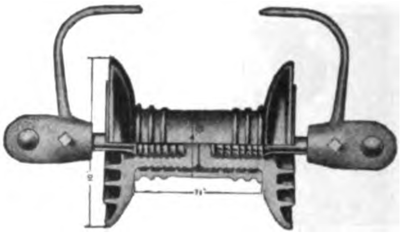
35,000 volt, pin type, porcelain strain insulator; dry test voltage 90,000, rain test voltage 60,000, leakage distance 10½ in., striking distance 4 in., size of pin hole 2 3/16 in. Made by The Pittsburg High Voltage Insulator Co., Derry, Pa.



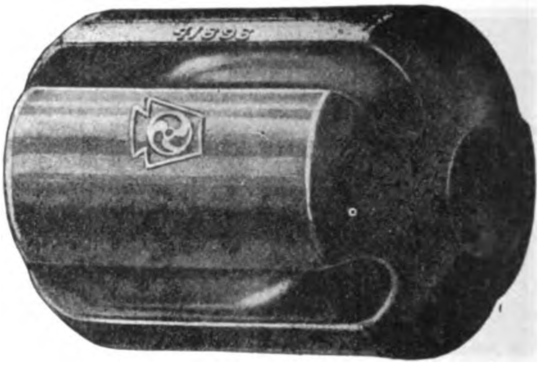
Three types of porcelain strain insulators, for voltages from 2,200 to 11,000 for steam and electric railroads; metal parts consist of a malleable iron cap, a drop forged steel eye bolt, and a malleable iron sleeve securing the eye bolt; working load from 1,600 to 8,000 lb. Made by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



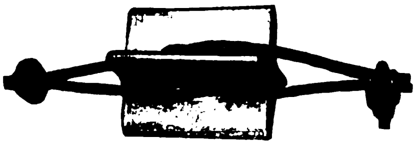
30,000 volt, porcelain strain insulator, for catenary and transmission service; test voltage 110,000; strength in lb. 20,000. Made by The Ohio Brass Co., Mansfield, Ohio.



30,000 volt, porcelain strain insulator with discharge horns for cutting down time lag for excessive surges; for catenary and transmission service; test voltage 110,000. strength in lb. 20,000. Made by The Ohio Brass Co., Mansfield, Ohio.

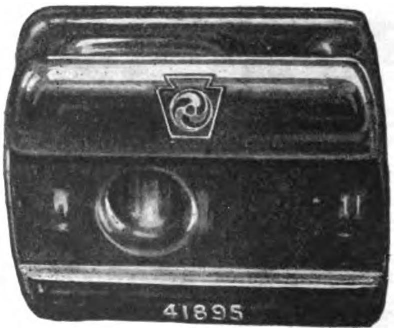


Porcelain strain insulator, guy wire type, for general purposes where requirements call for high insulation and great mechanical strength. Electric Service Supplies Co., 17th and Cambria streets, Philadelphia, Pa.



2,300-6,600 volt, porcelain strain insulator, for guy wires and dead ending; long leakage path, high mechanical strength. Made by The Ohio Brass Co., Mansfield, Ohio.

6,600 volt, dry process, porcelain strain insulator for guy or span wires; tensile strength 25,000 lb., dry test voltage 20,000; leakage distance 1¼ in., striking distance 1⅛ in. Made by The Pittsburg High Voltage Insulator Co., Derry, Pa.



Porcelain strain insulator, pole band type. Electric Service Supplies Co., 17th and Cambria streets, Philadelphia, Pa.

COMMON MATERIALS

SUCH AS ARE USED IN MANUFACTURING AND INSTALLING SPECIAL DEVICES. ALL NEW PRODUCTS ARE SHOWN IN THE DEPARTMENT SO NAMED.

No. 33---Glass

Chemically, any vitreous compound is called glass. Commercially, glass is a fused mixture of two or more silicates and is often named from the predominant base, as "soda glass," "potash glass," "lime glass," and "lead glass." It is usually transparent or at least translucent, and is brittle at ordinary temperatures. Sand is now generally used for obtaining the silicates which form the base of glass. The sand for the finer qualities of glass is quarried. The principal deposits of sand for glass making, in the United States are in Massachusetts, Illinois, Ohio, New Jersey, Pennsylvania, West Virginia, Indiana, Missouri, Maryland, and New York. Good sand, however, is available in almost every part of the country.

There are innumerable kinds of glass. Some are named for their uses, as bottle glass, mirror glass, optical glass, window glass. Others, according to the process of manufacture, as blown glass, pressed glass, cast glass, cut glass, ground glass. Others are named according to the localities from which obtained, as Biar, Bohemian, Murano, Venetian or Venice, and Saint Gobain glass. Still other names are given to glass according to finish and form, as kinkled, corrugated, fluted, and spun glass. Then there is agate, marbleized, rose, argentine, aventurine, favrile, bronzed, silvered, and platinized glass. The commonest kind of glass, however, is flint glass, and this includes all the myriad forms of glass with the possible exception of window and bottle glass. Besides all these there are stained, painted, colored, and mosaic glass.

The principal bases used for making all glasses are, sodium, potassium, calcium, and lead. A host of other ingredients are used in making glass, for coloring, etc., but these vary greatly with the many different glass companies and no definite information can be given as to their use. Very often colored glass is made ordinarily like any other glass, the coloring being accomplished by the addition of dyes (generally metal oxides) to the molten charge. The same metal produces several different colors at various temperatures. More often, however, colored glass is stained, painted, or enameled, and when joined by strips of lead to form a pattern, is called mosaic.

USES FOR GLASS IN THE ELECTRICAL TRADE

Probably the largest use for glass in the electrical trade is in connection with the lighting fixture business. For this class of trade the glass that is most used is a milky white opaque glass called bone, milk, opal, alabaster, or rice stone glass. In connection with this kind of glass attention is called to an article on Electrical Glassware, published in the October, 1913, number of the Electrical Record. Colored or stained glass, cut glass, and glass that is green on one side and white on the other, are often used as well for lighting fixtures. Colored glass is principally used for domes, cut glass for showers and chandeliers, and the white and green glass principally for half shades and parabola reflectors. Mirror glass, too, is used to a large extent for reflectors.

While it is impossible to state definitely the kind of glass that is used for each electrical device that contains glass in its make up, the following list of devices will serve to give an adequate idea of where and for what glass is used by manufacturers of electrical appliances and devices:

annunciators
arc lamps
bath light cabinets
beads, insulating
carriage calls
clocks
car headlights
current rectifiers
color caps
domes
drink mixers
electromedical apparatus
electroscopes
fuses
fire alarms
fountains, electric
flashlight lens
hydrometers
house numbers
insulators
illuminated columns
instruments
incubators
lamp bulbs
luminous radiators
lighting fixtures
marine fixtures
mirror shades
projectors
portables
showcase fixtures
shaving mirrors
signals
stage lights
static machines
vaporizers
voltage regulators
wet batteries

Glass is an insulator—a non-conductor of electricity—and is largely used for insulating purposes, principally in the form of insulators for pole line distribution of electrical energy, generally, however, for voltages of less than 5,000.

The names of the manufacturers of electrical glassware, for use in connection with lighting fixtures, will be found in the Classified Index published in every number of the Electrical Record under the headings of Shades, Glass, and Shades, Leaded or Mosaic. For arc lamps, under Shades, Arc Lamp, and for reflectors, under Shades, Mirror.

The electrolysis of water is a familiar example of the decomposing effect of the direct electric current. By the use of such a current water can be resolved into its component elements, hydrogen and oxygen. In order to do this the terminals of a direct electric current are inserted into a dish or glass containing the water. The positive terminal in known as the anode, and the negative as the cathode. When the current is turned on, it passes through the water from the positive to the negative terminal (from the anode to the cathode), and electrolyzes or decomposes the water. Similarly, if a direct current be passed through a solution of copper sulphate, which, in such case, is termed the electrolyte, copper will be deposited at the cathode and sulphuric acid gas will be given off at the anode. In refining cast copper, the anode is made of the impure metal, and a solution of copper sulphate is used as the electrolyte. Under the action of the electric current, the copper anode dissolves, and pure copper is redeposited at the cathode. Any substances other than copper in the anode, are, if the current is properly regulated, liberated and collect on the bottom of the tank containing the electrolyte.

SPECIAL DEVICES

SHOWING ALL TYPES WITHOUT REGARD TO TIME THEY HAVE BEEN ON THE MARKET. ALL NEW PRODUCTS ARE SHOWN IN DEPARTMENT SO NAMED.

No. 27---Rheostats (*Concluded*)

In the two previous installments of this article devices catalogued by the makers as rheostats were described and illustrated, as were also speed regulators. speed controllers, and drum controllers. In this the concluding installment, theatre dimmers and elevator controllers are considered, and a number of resistance units are shown.

THEATRE DIMMERS

A theatre dimmer is a form of rheostat used in theatres to vary the intensity of stage and auditorium lights. It usually consists of one or more plates with a number of resistance steps on each plate. Theatre dimmers are made for operation on two- and three-wire circuits, 110-220 volts when three wire, and 110 or 220 volts when two wire. For controlling carbon lamps, dimmers usually have 50 resistance steps to each plate; for tungsten lamps 100 steps are provided.

NON-INTERLOCKING DIMMERS

There are two classes of theatre dimmers, called non-interlocking and interlocking. Non-interlocking dimmers are usually of single plate, double plate, or bank construction. The plate types are for wall mounting either flat against wall or at right angles to it. Non-interlocking dimmers mounted in banks may be placed against the wall or on the floor, and the mechanism may be either self-contained (on the same frame with the plates), or mounted separately on a panel for remote control.

For small installations when but few lights are to be controlled, as in small theatres, lodge rooms, and clubs, 50-step, non-interlocking single or double plate dimmers for mounting either flat against the wall or at right angles to it, are recommended. For larger installations, 50-step, bank construction dimmers are usually preferable. The plates in this instance are mounted on a light frame of cast iron, with angle-iron cross pieces, and may be mounted against the wall so as to take up but little space, or may be placed on the floor when necessary. They may be arranged in one or two rows, but each plate is operated independently.

Then there are 100-step, non-interlocking dimmers, of bank construction, for tungsten lamps. The application of tungsten lamps to theatre lighting has made it desirable to have a dimmer with a larger number of regulating points than are now included with the standard carbon lamp dimmers, hence the 100-step dimmer. When the 50-step dimmer is used with tungsten lamps it is possible to detect the changes in illumination—the lamps appear to flicker slightly as the switch arm is passed from step to step. This flicker is eliminated in the 100-step dimmer.

INTERLOCKING DIMMERS

Interlocking dimmers are dimmers the plates of which are so arranged as to be operated simultaneously or independently as desired. By means of one or more master levers, individual levers may be interlocked so that several may be operated simultaneously, making it possible to control the lights of the various circuits independently or in groups. A further refinement is obtained by having a grand master control mechanism either in the form of a lever or hand wheel with slow motion drive, by which the separate master levers may be operated in gangs, to operate the entire bank from one point. For instance, lights of the same color in any part of the stage or auditorium may be dimmed or brightened simultaneously, or lights of various colors harmoniously blended. It is the interlocking dimmer which has greatly simplified the control of stage lighting and made possible the wonderful lighting effects of modern theatrical productions.

Interlocking dimmers are of bank construction and each plate contains 50 or 100 resistances steps or controlling points. There are two types, that with the mechanism self-contained (on the same frame with the plates) or that with mechanism mounted separately on a panel for remote control. Often, too, banks of interlocking dimmers are arranged for operation by motors.

In addition to the regular theatre dimmers there is a type of dimmer called spotlight dimmer, used for obtaining variations in the brilliancy of spotlights when incandescent lamps are used. Spotlight dimmers are designed for mounting on the standard of the spotlight. Illustrations of the dimmers mentioned follow.

ELEVATOR CONTROLLERS

Controllers designed especially for regulating and controlling the speeds and reversals of motors operating passenger and freight elevators and sidewalk lifts, are called elevator controllers. There are a large number of types of elevator controllers, some for use in connection with alternating current motors, others for direct current motors. In every instance, however, each type of controller is designed for a particular class of elevator service. No two types are exactly alike, though in some cases the differences are slight. However, elevator controllers may be divided into two classes—those for use in connection with special alternating current elevator motors, and those for use with special direct current elevator motors. They may be further subdivided in the following types:

Alternating current elevator controllers—Full magnet, for slow speed passenger or freight elevators, single speed, reversible. Semi-magnet; single speed reversible, for slow speed freight elevators, with self-contained and separate reversing switches, and single speed, non-reversible for double belted freight elevators. Semi-mechanical; single speed reversible, with self-contained and with separate reversing switches. Full mechanical; single speed reversible, for slow speed passenger or freight elevators.

Direct current elevator controllers—Full magnet; one and two speed reversible, for high speed passenger elevators, single speed for moderate speed passenger and freight elevators, and single speed for slow speed passenger and freight elevators. Semi-magnet; for slow speed passenger or freight elevators—single speed reversible, with dynamic brake and self-contained reversing switch, with switch but no brake, with brake and separate switch, with separate switch but no brake; and single speed non-reversible for double belted freight elevators. Semi-mechanical; single speed reversible, for slow speed belt driven elevators, for short lift sidewalk elevators, and for belted freight elevators.

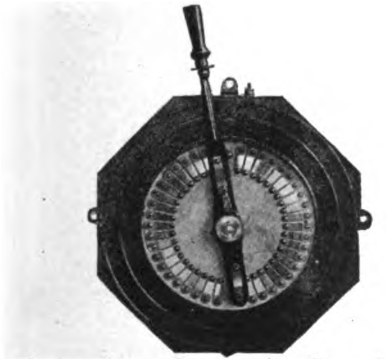
Illustrations of a number of types of elevator controllers follow, the caption under each cut giving data as to the type of controller shown, its characteristics, and for what particular service it is adapted.

RESISTANCE UNITS

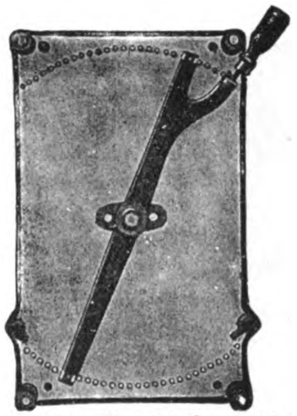
All devices that are rheostatic in principle, such as the starters, regulators, and controllers that have been described and illustrated in the three installments of this article contain a resistor. These resistors are sometimes mounted separately, more often, however, as part of the device, but in case of the resistor becoming useless, a new one may be obtained from the manufacturer of the device. In many cases it is possible to make a complete rheostat by the use of one or other types of resistor units made. As it may interest many of our readers to know what these resistor units look like and for what purposes they may be used, a number of illustrations of resistors, as they are generally called, are shown, the caption under each cut explaining the nature of the unit shown.

ifty-step, single plate, non-interlocking, theatre dimmer for right angle mounting; for small installations when but few lights are to be controlled. Made by General Electric Co., Schenectady, N. Y.

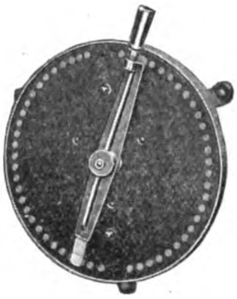
Round type theatre dimmers for 2 wire, 110 volt and 220 volt, d.c. or a.c. circuits, for 100 lamps or less; can be mounted flat on wall or switchboard. Each dimmer consists of a circular base of soapstone on which is mounted the successive steps of resistance, copper segments, and terminals. Made by Universal Electric Stage Lighting Co., 240 West 50th street, New York.



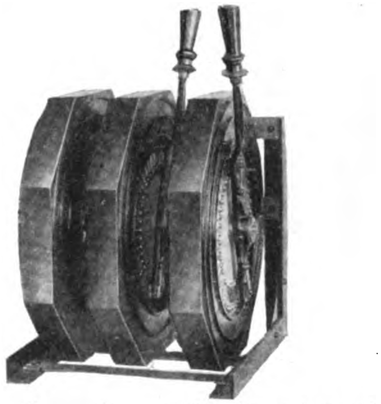
Single plate theatre dimmer for mounting flat against wall or switchboard; used to control 16 c.p. incandescent lamps in groups of from 40 to 50 lamps; two wire, for 110 volt circuits. Made by Industrial Controller Co., Milwaukee, Wis.



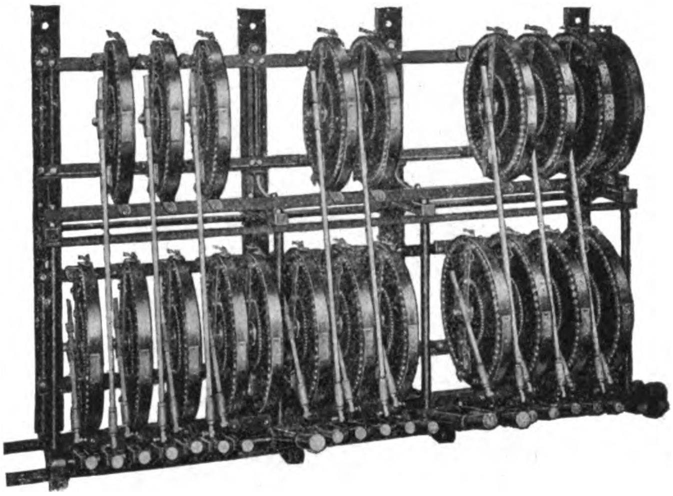
Non-interlocking type theatre dimmer; for 2 wire, 125 and 250 volt circuits, and for 3 wire 110-0-110 volts; 12-30 to 150-300, 16 c.p. lights. Made by Ward Leonard Electric Co., Bronxville, N. Y.



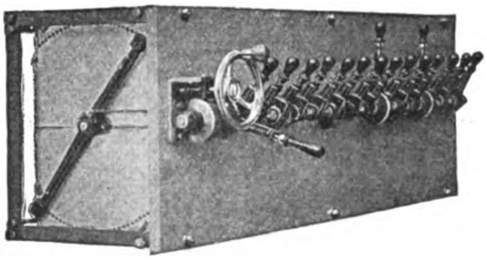
Fifty-step, single plate, non-interlocking, theatre dimmer for flat wall mounting; for small installations when but few lights are to be controlled, as in small theatres, lodge rooms, and clubs. Made by General Electric Co., Schenectady, N. Y.



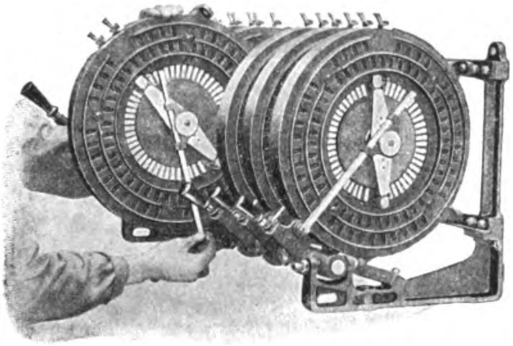
Double plate theatre dimmer for mounting flat against wall or switchboard; to control up to 100, 16 c.p., incandescent lamps; two wire for 110 volt circuits. Made by Industrial Controller Co., Milwaukee, Wis.



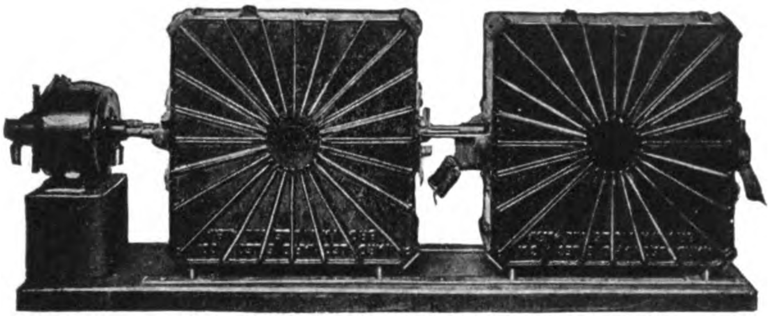
Interlocking, 100-step, self-contained, theatre dimmer with plates arranged in two rows; bank construction; operated by means of one or more master levers, individual levers being interlocked, making it possible to control lights of various circuits independently or in groups. Made by General Electric Co., Schenectady, N. Y.



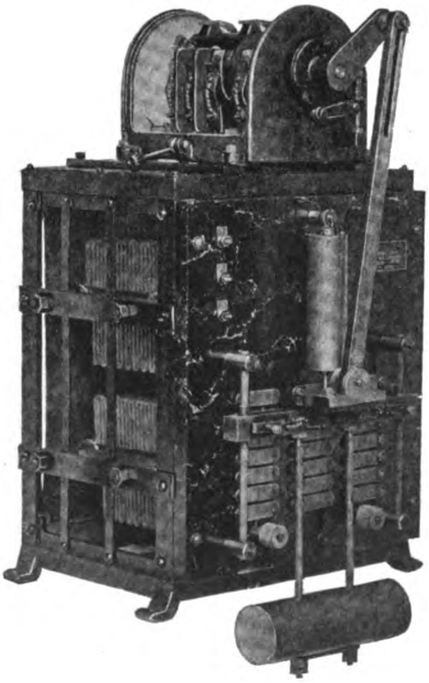
Bank of interlocking type theatre dimmers, controlled by one or more master levers; for 2-wire, 125 volt, and 3-wire, 110-0-110 volt circuits; 50 to 100 steps for controlling from 12-30 to 150-300, 50 watt lamps. Used when the majority of circuits to be controlled are for more than 50 lights each. Made by Ward Leonard Electric Co., Bronxville, N. Y.



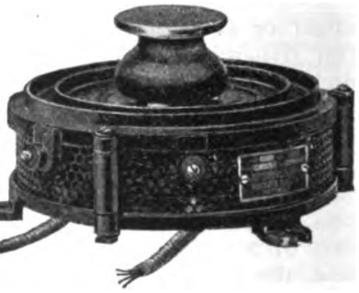
Seven plate bank of interlocking dimmers designed for mounting on switchboard or on wall above switchboard showing how easily any plate may be removed without disturbing the others. Made by the Cutler-Hammer Mfg. Co., Milwaukee, Wis.



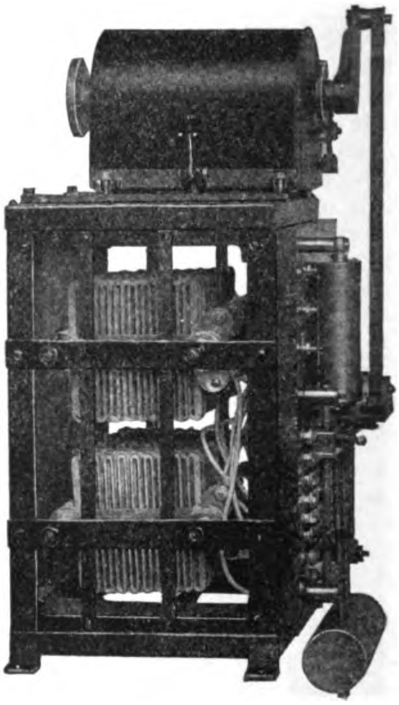
Bank of interlocking theatre dimmers arranged for motor drive; for 3 wire work; capacity 200, 16 c.p. lamps; controlled by master lever. Made by Ward Leonard Electric Co., Bronxville, N. Y.



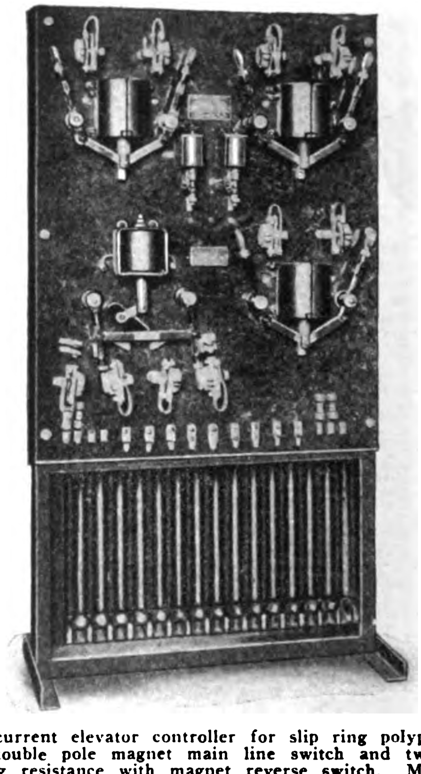
Mechanically operated elevator controller for from 5—40 h.p., 110, 220, and 500 volt, slip ring, a.c. motors. Made by Industrial Controller Co., Milwaukee, Wis.



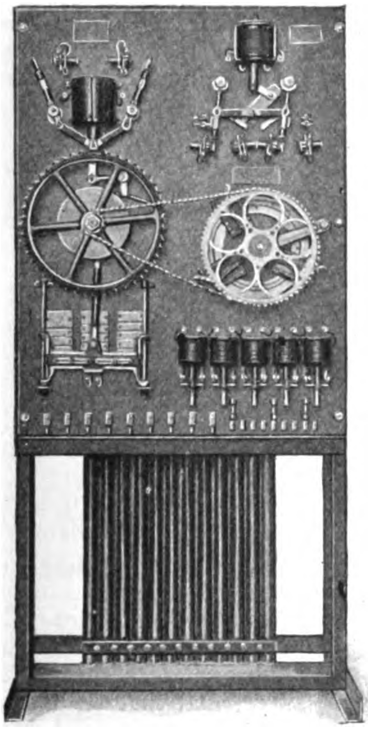
Spotlight dimmer for 50 and 100 c.p. incandescent **lamps. Made by** Ward Leonard Electric Co., Bronxville, N. Y.



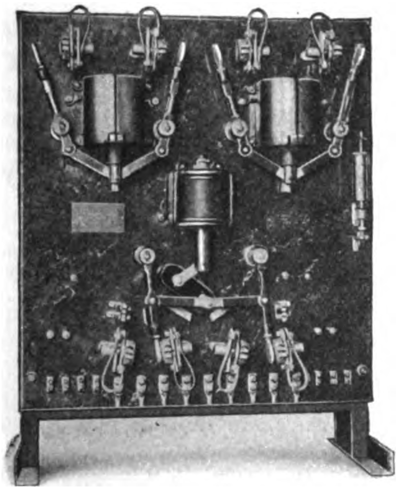
Mechanically operated elevator controller for from 5—30 h.p., 110, 220, and 500 volt, direct current motors. Made by Industrial Controller Co., Milwaukee, Wis.



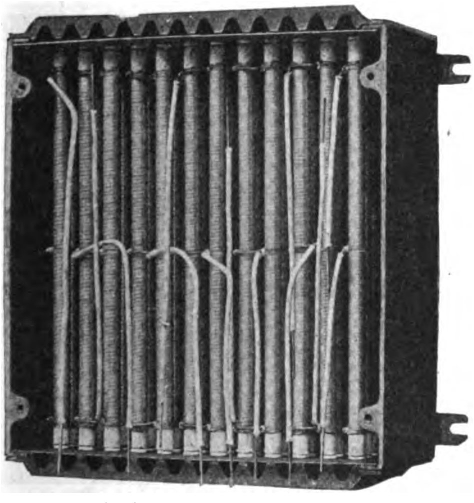
Alternating current elevator controller for slip ring polyphase motors; provides double pole magnet main line switch and two steps of starting resistance with magnet reverse switch. Made by Automatic Switch Co., 4 and 6 White street, New York.



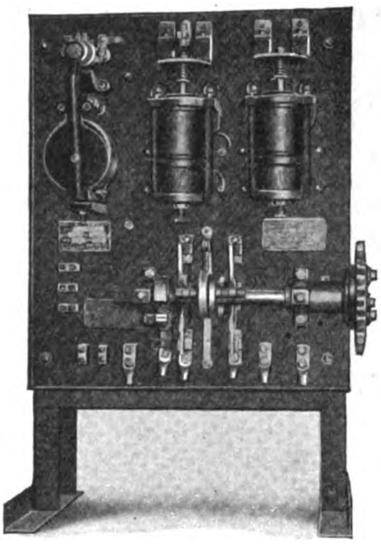
Full automatic, selector system, push button elevator controller for three landings, for a.c., slip ring, polyphase motors with motor driven starter. Made by Automatic Switch Co., 4 and 6 White street, New York.



Alternating current elevator controller for slip ring polyphase motors; double pole magnet main line switch, one step of starting resistance, and magnet reverse switch. Made by Automatic Switch Co., 4 and 6 White street, New York.

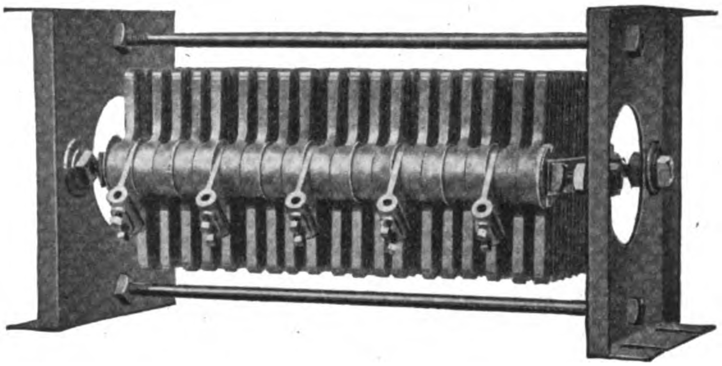


Resistors, consisting of wire wound asbestos tubes fitted in cast iron box provided with ventilating apertures; for rheostats and starters of capacities up to 50 horse power. Made by Industrial Controller Co., Milwaukee, Wis.

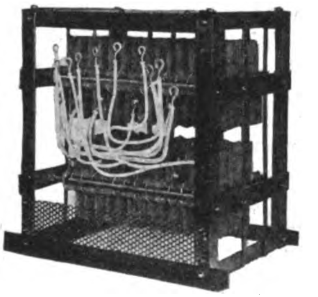


Compound, multiple magnet, current limiting, elevator controller, two step, with magnet line switch and mechanical reversing switch, for small semi-magnet elevator control. Made by Automatic Switch Co., 4 and 6 White Street, New York.

Compression type resistance unit without heat radiating fins, consisting of a column of prepared graphite discs. The contact resistance between the discs composing the resistor column is subject to variation by pressure, thereby producing proportionate resistance charges in the column as a whole. Made by Allen-Bradley Co., 495-497 Clinton street, Milwaukee, Wis.



Bank of grid resistance. Made by Union Electric Mfg. Co., 499 Broadway, Milwaukee, Wis.



Resistors for small capacity rheostats and starters, consisting of asbestos tubes on which is wound a special grade of resistance wire; the ends of the tubes are fitted with porcelain nipples by means of which they are held in place within a cast iron casing. Made by Industrial Controller Co., Milwaukee, Wis.

The Stannos or Concentric Wiring System

BY R. B. BENJAMIN

The proposed stannos or concentric wiring system, now being advocated by the National Electric Light Association and certain manufacturers of electrical generating and central station apparatus, presents important problems affecting not only the hazards of life and fire, but if adopted, bids fair to seriously disturb many lines of manufacture.

As to the merits of the system, it would be difficult at this time to deal very specifically with this, as nothing definite has yet been proposed. The proposed system presents three probable sources of danger to life and property:

1. Danger of electric shock, due to personal contact with the bare conductor of a supposedly grounded system where the ground connection has been omitted or improperly made, and where the central conductor has become accidentally grounded or where the continuity of the return conductor has been broken.

2. Danger of fire, due to poor connections between adjacent lengths of return conductor, cracks around the conductor where kinked or otherwise damaged or by short circuits caused by accidental damage of insulation, due to light wall of conductor.

3. Danger to iron structures and piping systems, due to electrolytic action.

If the return conductor, which in most cases would be exposed, is properly installed with all joints and grounds properly made, the danger from shock would be less than in the present system; but if a wireman failed to make the ground connection, or made it improperly, the danger to life would be greatly increased. The fire hazard, involving the life hazard as well, would be confined more largely to the wire itself and the wiring connections, and this would naturally depend much upon the character of the return conductor and the means provided for making connections with same.

There is in my mind considerable danger in the use of the proposed concentric wire in which the return conductor consists of a light copper tube surrounding the insulation. It is only natural to suppose that in practice this wire would receive a good many kinks in being handled, and that these kinks would be straightened out by the wiremen, and the wire installed without close inspection to see whether this conductor was cracked at the point where it had been bruised or kinked. If suspended by staples or held by nails, as would sometimes be the case, some of these weak places would be likely to open up, due to vibration, and cause an imperfect contact, resulting in an arc, with the danger of starting fire or at least destroying the wire. Setting a staple too tight might often partially cut the conductor, or a faulty blow of the hammer might seriously damage it. In many cases there would be no means of replacing the wire, if plastered in or concealed, as has been advocated. It would be impossible for an inspector to know that the wires were run in perfectly good condition, as such defects only show up after being in use for some time.

The question of electrolysis is one that should receive careful consideration by those competent of judging of such matters. It would appear to me that the ground return system would inevitably increase the trouble from this source.

It should not be forgotten that the more simple the installation of a system the more likelihood there is of it being installed by inexperienced people, and in spite of any restrictions which may be placed upon the installation of such a system in the early stages or at any future time, so long as the goods are on the market and are cheaper than devices previously used, they will be purchased and installed by the public without regard for rules.

Is it not almost certain that in a great many cases extensions of concentric wire and fittings will be made in existing ungrounded installations and many new circuits run without any attempt to ground? The flexibility of the wire would suggest to the amateur, as well as the electrician, the convenience of running it concealed as a fishing proposition. In my judgment the use of this system, if once introduced, cannot be controlled, and therefore if unsafe for concealed work it should not be placed on the market.

The concerns that would be most likely to be detrimentally affected by the adoption of such a system appear to be numerous manufacturers of wire and electrical and mechanical devices used in wiring and lighting systems. Some of these manufacturers would temporarily, at least, be affected greatly.

The disposition of the manufacturers generally appears to be to have the system thoroughly studied and considered to determine whether or not it is a real advance in the art before it is permitted to be put into service to any extent, and that such consideration, in order to be effective, should extend over a considerable period of time. Should it then be proved to be a reliable and desirable system, due public notice should be given by the Underwriters as to when approval should go into effect, giving ample time for the manufacturers who would be affected by such a radical departure from present standards to adjust their business to the new conditions. In my judgment such careful consideration would require approximately two years' time, and if passed upon favorably by the Electrical Committee of the Underwriters', another year's time should be given manufacturers in which to prepare for the change.

If this system should be adopted, it would seem proper to place the responsibility for making proper ground connections upon the central station, and in order to eliminate, as far as possible, the danger to life due to the unauthorized use of concentric wire, it would appear desirable that all circuits in all buildings be thoroughly grounded and solidly connected without any fuses in the return conductors. This would be equivalent to grounding the secondaries of all transformers.

The use of this system would require a large line of new fittings, which would replace very many of those now on the market. Insulating joints for light circuits would disappear; fibre lined sockets would be replaced with cheaper forms; present forms of outlet boxes would yield to more convenient forms; fuse boxes and panel boards would become single pole, with no fuses for neutral.

It has been stated by the advocates of the concentric system that they are not necessarily working for the adoption of this particular system, but for some system that will cheapen the cost of installation and thereby make it possible for the central stations to obtain a large increase in load by obtaining customers who are unable to pay the present price for wiring their buildings. It occurs to me that in view of the fact that the cost of installation is a small item, as compared with the cost of current and charges often made by central stations for bringing the service to the buildings, unless some suitable reduction in said rates is provided the new system will not bring the results desired.

Assuming that it is safe to adopt grounded systems, would it not be safer and disturb present conditions less to use rigid or flexible steel conduit in smaller sizes (¼ in. or ⅜ in.) and a single conductor corresponding to the present No. 14 rubber covered wire used for conduit purposes, thus making it possible to pull in and replace burned out wires where concealed at the same time giving proper protection to the wire by means of the heavier return conductor in the form of flexible or rigid conduit. A flexible conduit would serve practically all purposes for exposed work for channeling in plaster and fishing through partitions without danger of becoming kinked in the process of installing. This would not disturb the manufacturer of wire to a very great extent, and would admit of the continuance of the use of outlet boxes, condulets, unilets, and a great variety of fittings of this character, with the addition of suitable means for electrically connecting the various runs together, grounding the fixtures, etc.

While this system might not be as cheap as the concentric wire, it would in my judgment be far safer and should be considerably cheaper than the present system.

One of the Hazards in Concentric Wiring

BY C. W. ABBOTT

One of the principal claims made for concentric wiring by those advocating its early adoption is built around the excellent protection its use is said to afford both life and property, with particular reference to the former.

While it is probably true that this claim would prove up in an installation made in strict accordance with proper rules and under the careful supervision of an inspection department, it is most certainly true, on the other hand, that a concentric system improperly installed and without proper inspection would enormously increase the present life and property hazard. It is the writer's desire to direct attention to the fact that a vast amount of concentric wiring would surely be so installed in the event of its adoption.

As is well known to everyone familiar with field conditions, a tremendous volume of wiring is being done at present without regard to the Code and, in many instances, in direct violation of its most important requirements. It is also well known that this condition exists in towns and cities where rigid inspection is maintained by either municipal, underwriter, or central station authorities, or by all three, to as great if not a greater extent as in localities where no inspection exists, for the bulk of this work is done by the household "scissors electrician" and is in the nature of alterations, extensions, and repairs, for which no successful method of forcing inspection has ever been or probably ever will be, devised.

Striking testimony of the magnitude of this class of work is presented by the well organized and well placed retail counters which may now be found in almost any department store, large hardware store and even in many 5c and 10c stores, where short lengths of wire or lamp cord, sockets, receptacles, rosettes, fuses, and the like are attractively arranged in convenient packages. Moreover, this class of business has grown to such attractive proportions that many of the electrical jobbers are establishing retail stores on the prominent thoroughfares in an effort to reach the public and obtain their share of it.

In addition to this work by the householder there are a vast number of uninspected jobs done by engineers and electricians of large manufacturing and mercantile properties; by janitors and handymen in apartments and all manner of similar buildings; by the small contractor who never reports his work if it is possible to avoid it; and by countless other classes of mechanics who attempt to fatten their earnings by evening wiring.

Then, too, there are the hundreds upon hundreds of towns and villages which an inspector rarely if ever visits. It has been reliably estimated that less than 50 per cent. of the United States is at present under more or less regular inspection, and a check made in several typical inspection territories has shown that only 50 per cent. to 70 per cent. of the connected sockets in a given locality have been reported for inspection at the time of installation.

The outline of "uncontrolled" conditions given above is in no sense overdrawn, nor is it based upon conjecture or theory. It is a plain statement of fact as will be attested by any person having a knowledge of actual field conditions. That it has not been responsible for more damage to life and property is due, in the writer's opinion, to the fact that the only materials and devices thus far available have been of "approved" or "standard" type, in which a good margin of safety is provided. By which is meant that the insulation of wire, lamp cord, sockets, snap switches, and the like is uniformly good enough and their construction sufficiently rugged to withstand a good deal of abuse at the hands of unskilled, inexperienced amateur electricians.

What would be the result of placing concentric wire and its fittings within reach of the class responsible for this vast amount of "uncontrolled" wiring? If it can be manufactured and sold at as low a cost as its advocates claim, it most certainly would soon become a "leader" on the counters of the department, hardware, and 5 and 10c stores.

In considering this grave question the following points must be borne in mind:

1. That it is not necessary to ground concentric wire to obtain results.
2. That it is much cheaper and easier not to ground it.
3. That the two above points being true, it is absolutely certain that little if any of it would be grounded by persons doing "uncontrolled" wiring.
4. That a bare, ungrounded conductor carrying 110 v. alternating and often within easy reach, must be considered a serious menace to property and, in many instances, to life.

In fact, when viewed from this angle, the very real danger of adopting concentric systems for use in the United States looms to such huge proportions that we can only believe its advocates have been lead to favor it through mentally applying it to more or less idealized conditions and allowing themselves to be carried away by the picture thus obtained.

Fortunately, however, the National Electric Committee have always studied proposed Code changes from all angles, with a view to working for a consistent margin of safety on the job where inspection is either not procurable or is purposely avoided, as well as for the job under the close supervision of some inspection department, hence the great danger of placing concentric wire and fittings within reach of the general public will undoubtedly receive careful consideration at their hands.

Those favoring concentric will probably reply to the points raised in this article by pointing to the more or less successful use of concentric wire in certain parts of

Europe. This does not constitute an answer, in the writer's opinion, for, while it is true that "human nature is the same the world over," it is equally true that the average American citizen has an impatient, inborn disregard for rules or regulations which he can construe as attempted interference with the manner in which he conducts the details of his home or office, that is widely at variance with the bred-in-the-bone respect accorded similar rules by most of his European brethren.

We can no more hope to legislate the danger out of concentric where the average American citizen with both his "rights" and the need of a light in his coal bin jointly in mind, is concerned, than we can hope to import the famous German "verboten" and expect to see it as religiously observed as it is in the realm of the Kaiser.

Meeting of Electrical Committee, National Fire Protection Association, March 24-25, 1915

The 20th annual meeting of the Electrical Committee of the National Fire Protection Association will be held at the rooms of the New York Board of Fire Underwriters, 123 William street, New York, on March 24-25, 1915, beginning at 10 a. m. This promises to be the most interesting meeting that this committee has ever held. The preliminary Bulletin issued by the secretary of the Electrical Committee from his office at 141 Milk street, Boston, Mass., shows a number of suggestions for changes in the Code that are of more than ordinary interest and importance to the industry. The changes suggested include fuses in multiple; bell-ringing and toy transformers; theatre wiring; high wattage lamps; variable speed motors; construction of sockets; grounding of conduit; hard rubber bushings and sockets; induction motors; wiring of garages; cabinets; fixtures; safety to life; and grounded concentric wiring systems.

On the subject of grounded concentric wiring systems—a subject in which everyone is interested at this time—the committee comments at length. For the benefit of our readers who have not been able to obtain copies of this Bulletin, we publish the report of the committee as it appears in the Bulletin. The report in full is as follows:

The interest in a system of grounded concentric wiring has arisen chiefly from two considerations:—

First, A desire for a system of wiring possessing advantages of low cost, ease of installation and good appearance.

Second, A desire to protect persons against injury by the use of a grounded system having no ungrounded exposed current-carrying parts.

It is the intent of the following suggested and illustrative rules to prescribe, only for possible experimental and development purposes, the general conditions for a system of grounded concentric wiring. These illustrative rules are therefore only a partial outline of possible future requirements, and are subject to revision, modification and extension, resulting from further information and experience when such is obtained. A system which fulfills the condition outlined below, and no more, will not necessarily be acceptable, and suggestions for the further development of similar systems and the requirements applying to them are invited. All appliances and systems should be submitted to Underwriters' Laboratories for examination and report.

a. Must be connected only to normally grounded systems where the difference of potential between any wire and ground is not over 150 volts.

The outer conductor or sheath must be permanently and effectively grounded at or near the point of supply of the concentric wire system and on the house side of the service switch and fuses.

b. Must be used only for branch circuits of not over 660 watts each nor more than 16 sockets or receptacles.

c. Must be used for exposed work only. Must never be run on or in floors or in concealed spaces except where passing directly through floors or partitions. Where passing through a floor must be carried through an iron pipe extending from the ceiling below to a point at least three inches above the flooring. Additional mechanical protection may be required by the Inspection Department.

d. Must be continuous from outlet to outlet without splices or taps unless approved splice or tap fittings are used.

e. The radius of the inner edge of any bend to be not less than three and one-half inches.

f. The outer conductor or sheath must be permanently and effectively connected to the grounded supply wire at the point of supply of the concentric system.

g. Must be equipped at every outlet, splice or tap with a fitting approved for this purpose.

The ends of the outer conductor or sheath must be secured at every outlet, splice or tap so as to secure electrical continuity between all portions of the outer conductor or sheath.

No soldered connections shall be made to the outer conductor or sheath at any point, but approved clamping devices, or bonding posts on terminal plates in fittings shall be used for all tap wires to sockets or other connected fittings.

h. No switches shall be placed in the outer conductor or sheath and no switches in any part of the system to which the concentric wiring is attached shall be of a type or so installed that the outer conductor or sheath can be disconnected from the grounded wire of the supply system without simultaneously disconnecting the inner wires.

i. Fuses must not be placed on the outer conductor or sheath of the concentric system nor in the grounded wire of the supply thereto within the building in such a way that their operation can under any condition break the connection of the outer conductor or sheath with the grounded wire of the supply system within the building.

An approved fuse of capacity not larger than 10 amperes must be placed so as to protect the inner conductor of each 660-watt circuit.

j. At all outlets or junction points approved fittings must be used which shall provide for the suitable insulation of the inner conductor, and secure electrical continuity of the outer conductor or sheath through the fittings.

k. Where concentric wires enter or leave metal outlet or switch boxes or cabinets, the outer conductor or sheath shall be mechanically and electrically secured thereto by suitable clamps or other approved means.

Where liable to come into contact with water or gas pipes or other grounded metal, the outer conductor or sheath must be effectively connected electrically thereto or insulated therefrom by some reliable means.

l. Must be securely supported at least every 4½ feet by means of approved clamps.

CONSTRUCTION RULES.

m. Must comply with the requirements of the National Electrical Code Rules Nos. 49, 50-*a*, *b*, *c*, *e*, *g* and *i*, except that insulation resistance and voltage tests shall be made without immersion and between the inner and outer conductors.

n. Concentric wires for systems of this type must be of approved form and construction, and the inner conductor must be of copper of No. 14 B & S gage.

o. Between the insulation and the outer conductor there must be a firm continuous tape or braid of approved material.

p. The inner and outer conductors must be of copper and the inner conductor must be thoroughly tinned.

q. The outer conductor or sheath must be so applied as to fit closely and tightly and must be continuous. The conductivity of the outer conductor or sheath must not be less than that of the inner conductor. The completed wire must be of approximately circular section at all points.

Electrical Manufacturers Meeting March 9

The organization committee of the electrical manufacturers which was appointed in accordance with motion made at the meeting of electrical manufacturers, at the Hotel Biltmore, New York, January 12, find that the task given to them is of such moment to the electrical industry that more time will be needed by them than the period first contemplated. The result is that the chairman of the meeting of electrical manufacturers of January 12 postponed the meeting from February 9 to March 9, 1915.

At a meeting of the organization committee on February 1, that committee decided to recommend to a meeting of the electrical manufacturers of the United States, a plan for the formation immediately of a national association of the manufacturers of electrical supplies.

Some Uses for Wood in the Electrical Industry

Though most of the wood consumed in the electrical industry is used in the form of poles, cross-arms, insulator pins, and brackets for carrying transmission wires, a large amount of wood of various kinds is used every year in the making of handles, cabinets and boxes, and bases for instruments. A small amount of wood in the form of hard maple splints and wedges is used in dynamo and motor building, chiefly as fillers in armature and commutator construction. The use of wood in dynamos and motors, however, is almost nil, as the active material in such apparatus consists of about 75 per cent. of iron and 25 per cent. of copper, forming about 42 per cent. of the total weight of the machine. The other 58 per cent. is inactive material, a small fraction of 1 per cent. of this amount being wood. In dynamo and motor building the wood used serves both as a mechanical support and an electrical insulator, its insulating properties being excellent. Wood is used in great variety in making the following electrical products:

Annunciator frames
Attachment plugs
Bases for battery motors
Bases for instruments
Bases for switches
Battery cases
Battery grids
Billets
Box bells
Box buzzers
Brackets
Bushings
Cases for commutator sticks
Chains
Cleats
Coil boxes
Commutator plugs
Conduit plugs
Connectors
Cord adjusters
Cross-arms
Dowel pins
Electric matting
Fan blades
Fixture blocks
Fixtures, lighting
Frames
Handles, sadiron
Handles, tool
Handles, lamp
Handles, switch
Instrument cabinets
Insulator pins
Insulators
Knobs
Lamp bases
Lamp pedestals
Magneto cases
Mats
Molding
Panelboard cabinets
Pole steps
Poles
Push buttons
Reels
Semaphore arms
Shade frames
Sockets for Christmas tree outfits
Splicing links
Spools
Strain insulators
Telephone wall boxes
Telephone switchboards
Tubes
Tubular fuses
Wedges for various purposes

KINDS OF WOOD USED

The bulk of the wood used in the electrical industry consists of white cedar, red cedar, locust, yellow pine, and cypress. These woods are used chiefly for large individual pieces such as poles, cross-arms, pins and brackets. Including these, the kinds of woods used in electrical work may be grouped as follows:

Ash
Basswood
Beech
Birch, paper
Birch, black
Cedar, white
Cedar, red
Cherry
Chestnut
Cypress
Eucalyptus
Fir, yellow
Hemlock
Hickory
Juniper
Locust, yellow
Locust, black
Mahogany
Maple, sugar
Maple, birdseye
Oak, white
Oak, red
Pine, white
Pine, yellow
Pine, red
Pine, shortleaf
Poplar, yellow
Poplar, white
Red gum
Redwood
Rosewood
Spruce
Walnut, black
Walnut, circassian

In New York state the consumption of spruce is almost double that of any other species, and it is used almost exclusively for conduits, cable reels, lagging reels and spools for wire. One firm reports the use of over 700,000 feet for cable reels, etc. Other woods used for reels, in the order of their importance, are as follows: beech, white pine, yellow poplar, red gum, and basswood.

Signal devices consume over 1,000,000 feet annually, nearly all of the arborvitæ (northern white cedar) and practically all of the bald cypress going into railroad signal devices. These woods have the commendable quality of being able to withstand constant exposure to the elements. Other woods used for signals, in small amount, include hemlock, oak, red pine, and shortleaf pine.

Rough telephone boxes are made of hemlock, white oak, red oak, yellow poplar and sugar maple. Telephone booths, styles, rails and panels demand high-grade stock of red oak, birch and white oak, much of the latter wood being quarter-sawed.

For framework and cores for veneer, chestnut and yellow poplar are largely used; while for "filling" between steel plates and blocks, white oak is preferred. Switchboards, telephone cabinets, and miscellaneous supplies call for cherry, white oak, white pine, beech, sugar maple, birch, yellow poplar, longleaf pine, black walnut, mahogany, rosewood, Circassian walnut.

Yellow poplar is used for base blocks for electrical contrivances, and is coming into very high favor instead of white oak for such use. It is more easily worked, warps and shrinks less, and is lighter and cheaper than oak.

MAKING SWITCH AND SADIRON HANDLES

The making of sadiron and switch handles forms so important a branch of the industry that a brief description of the process is appended. These handles are turned from birch lumber, yet many turners use maple and beech, according to the location of their factories; but where birch is available, its use is more general. Birch seems to have a self-lubricating property which is lacking in maple and beech. The three woods are similar, all being hard woods and all susceptible of a high grade finish, in varnish, shellac, oil, and enamels. Many buyers of handles to-day specify maple, whereas many of the "maple" handles are really made from birch or beech. In the end they give the same general results.

This lumber as used in the wood turning business is cut in the winter months, or as soon as the sap has left it. On the first snow it is hauled to the mills, where men work in sweaters and gloves. The logs are cut 4 feet long. In Maine these logs are called "bolts." The lumber is then cut into squares ranging from ¼ in to 4 in. square, and in some instances larger. From the mill they are taken to open ground and "cobbed" up—spaced so as to let the air circulate through. Here they remain until spring, when they are put under cover. This method is known as air drying and the lumber holds its "life" and the wood becomes brittle. After seasoning, the squares are taken into the factory and fitted for the lathes; knots are cut out and the sticks are cut to proper lengths to make the specific handle to the best advantage. The knife is forged and shaped to make the exact design desired and is then put in the machine. The sticks are then "chucked" and turned.

The handles are taken to "rattlers" or "rumblers" and rolled smooth.

About all switch handles are finished in enamel, either rubberoid or jet. If such a finish is to be applied, the handles are rolled in pumice stone, which not only smooths them, but the dust fills the pores of the wood. They are then placed on fixtures and dipped in a filler and then in a jet enamel, allowed to drip and dry in the air to a certain extent, and then the fixtures are put in proper ovens and baked. Then a second coat of the desired enamel is applied and the baking is repeated. After enameling, the handles are ferruled and packed and ready for shipment.

These are the general steps taken for all turned articles. If a varnish or shellac finish is wanted, such as prevails in sadiron handles, the process of applying is different. Varnish is usually put on with a brush, while shellac is either put on by hand, known as polishing, or tumbled in barrels, a method which gives a very fine shellac finish at a low cost.

DATA ON ELECTRICAL WOODWORKERS

Only a few woodworking concerns make a business of furnishing to electrical manufacturers the wooden parts of their products. Nearly all electrical manufacturers buy their wood in bulk from lumber dealers and do the woodworking necessary in their own shops. For this reason we are unable to give the names of but few woodworkers other than those engaged in trading in bulky products like poles, cross-arms, pins, and brackets. The names of these concerns, the woods they work, the uses to which these woods are put, and the treatment to which they are subjected to arrest decay are all indicated in the annexed table.

Company	Kinds of Wood	Forms in Which Wood is Supplied	How Wood Is Treated
American Creosote Co., New York, N. Y.	Yellow pine	Poles, cross-arms	Impregnated with creosote under heavy pressure
American Creosote Works, New Orleans, La.	Southern pine	Poles, cross-arms	Bethel or full cell process Creosoted
American Cross-Arm Co., Chicago, Ill.	Fir Yellow pine	Cross-arms, pins, brackets, conduit	Creosoted
Bates & Warfield, Plainville, Conn.	Oak, ash and black birch	Fixture blocks, switch handles, bases	**Orange shellac and wood alcohol**
Berthold & Jennings Lumber Co., St. Louis, Mo.	Cypress, yellow pine, fir	Poles, cross-arms	No treatment required
F. Bissell Co., Toledo, Ohio.	Cedar, Washington fir, long leaf yellow pine, black locust, oak	Poles, cross-arms, pins, brackets	No treatment required
Blade Signal & Mfg. Co., Boston, Mass.	Maple	Compressed cleats	Dipped in linseed oil
W. B. Brown Co., Bluffton, Ind.	Oak, mahogany, walnut, poplar, bird's-eye maple	Chandeliers, portables	Stained, shellaced and waxed, according to finish required
Central Lumber Co., Chattanooga, Tenn.	Yellow pine, oak, locust	Cross-arms, insulator pins, brackets, moldings	**Painted or dipped**
John A. Cranston Lumber Co., Wilmington, Del.	White oak, mixed oak, long leaf yellow pine	Poles, cross-arms	**No treatment required**
Crawford Cedar Co., Menominee, Mich.	Northern white cedar	Poles	Carbolineum and creosote
E. B. Estes & Sons, New York, N. Y.	Maple, oak, mahogany, walnut, birch	Switch handles, switch bases, fixture blocks, battery boxes, sad iron handles, cord adjusters	No treatment required
B. F. & R. P. Gravely, Martinsville, Va.	Locust, oak	Cross-arms, pins, brackets, pole steps	Painted, creosoted, boiled in paraffine
Humbird Lumber Co., Sandpoint, Idaho.	Red cedar	Poles	No treatment required
A. L. Lewis & Co., Inc., Marion, Ind.	Oak, mahogany	Chandeliers, portables, floor lamps	Dipped into stains or shellaced with wax finish
Lindsley Bros. Co., Spokane, Wash.	Western red cedar Douglas fir	Poles, cross-arms	Avenarus carbolineum when necessary
Locust Pin Co., Inc., Front Royal, Va.	Locust, oak	Pins, brackets	Boiled in paraffine or dipped in paint
Louisiana Red Cypress Co., New Orleans, La.	Louisiana red cypress	Cross-arms	No treatment required
H. Marcus, Muscoda, Wis.	Oak	Pins, brackets	Painted and creosoted
McCulloch & Moss Lumber Co., Minneapolis, Minn.	Northern white cedar	Poles	No treatment required
McGlauflin Mfg. Co., Sunnyvale, Cal.	Eucalyptus	Pins, brackets, pole steps	No treatment required

Company	Kinds of Wood	Forms in Which Wood is Supplied	How Wood is Treated
B. C. Milan & Son, Frankfort, Ky.	Maple	Cord adjusters	Enamelled
Narragansette Machine Co., Providence, R. I.	Paper birch	Switch handles	Dip in Japan and bake under high heat
National Pin & Bracket Co., Madison, Ind.	Oak, locust	Pins, brackets, pole steps	Creosoted or painted
National Pole Co., Escanaba, Mich.	Northern white cedar Western cedar	Poles, ties	Carbolineum or creosote
J. A. Navarre, Toledo, Ohio.	Northern cedar Western cedar, fir Yellow pine, locust	Poles, cross-arms, pins	Locust pins boiled in linseed oil, paraffine or steerine Pole butts, C-A wood preserver, open tank process
Northern Mercantile Co., Ltd., Sandpoint, Idaho.	Idaho red cedar	Poles	No treatment required
Pacific Coast Coal Co., Spokane, Wash.	Western cedar	Poles	No treatment required
Page & Hill Co., Minneapolis, Minn.	White and red cedar	Poles	Butt treatment, upright tank system—creosote or carbolineum
T. M. Partridge Lumber Co., Minneapolis, Minn.	Northern white cedar	Poles, ties	Painted, dipped, or impregnated
Port Royal Pin Mill, Port Royal, Pa.	Locust (Yellow and black)	Insulator pins	Any preservative desired
John L. Roper Lumber Co., Norfolk, Va.	Southern white cedar Juniper	Cross-arms, poles	No treatment required
W. S. Seaman Co., Milwaukee, Wis.	Oak, birch	Telephone booths	No treatment required
Southern Exchange Co., New York, N. Y.	White cedar, long leaf pine, chestnut, locust, oak	Poles, cross-arms, insulator pins, brackets	Dead oil of coal tar by vacuum process
Sun Enamel Works, Leominster, Mass.	White birch	Handles for switches, sad irons, vibrators, electric cooking utensils	Dipped in baking enamel
Western Lumber Pole Co., Denver, Colo.	Western red cedar	Poles	With carbolineum
E. B. Williams Cypress Co., Paterson, La.	Cypress	Poles, cross-arms, anchor blocks	No treatment required

PRESERVING WOOD FROM DECAY

The object of subjecting wood to preservative treatment is of course to prevent it from acting as host to a fungus growth. Various kinds of antiseptics are used for this purpose, the method of appling them being called by the name of some specific process. Among these processes are the following:

Kyanizing—This consists in steeping timber in a one per cent. solution of mercury chloride for seven to eleven days.

Burnettizing—This comprises preliminary steaming, followed by impregnation in a 2 per cent. solution of zinc chloride under a pressure of 120 pounds.

Creosoting—This involves steaming the tried timber, heating under reduced pressure and treating with creosote oil under a pressure of 100 to 180 pounds per square inch.

Curtis-Isaacs process—The timber and creosote are heated to above the boiling point of the sap at ordinary pressure in a retort having vents open to the air; the vents are then closed and the creosote is forced into the wood under pressure.

Lowry process—Treating with creosote oil at 80 degrees centigrade under a pressure of 180 pounds per square inch, followed by draining and a rapid vacuum treatment.

Zinc-creosote, or Rutger process—An emulsion of ½ pound of dry zinc and 1½ to 4 pounds of creosote oil per cubic foot of timber is used, the emulsion being continuously agitated.

Hasselmann process—Uses a solution containing copper, aluminum, and potassium sulphates heated to 125 degrees centigrade under a pressure of 35 pounds per square inch.

Saccharine solution or Powellizing process—This is suitable for the treatment of green wood, a solution consisting mainly of sugar with a small percentage of arsenic is used.

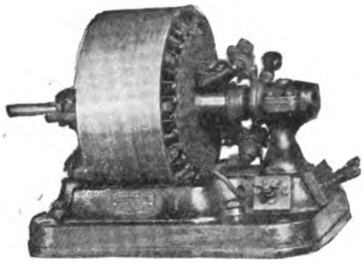
A recent tabulation of the comparative durability of different woods used for cross-arms shows Washington or yellow fir first, with a life of over 30 years, followed by longleaf yellow pine, 10 to 20 years; cypress, 10 to 12 years; Norway pine, 6 to 8 years; juniper, 6 to 8 years; oak, 4 to 8 years; shortleaf yellow pine, 3 to 5 years.

Those who are interested in the use of wood in other industries are referred to the Forester, Department of Agriculture, Washington, D. C. That department has a valuable list of pamphlets on this subject.

CONTRACTORS' SCRAPBOOK

The Council of Superior, Wis., has passed an ordinance providing for the office of an electric inspector. Under this ordinance the electric inspector is empowered to enter and inspect all buildings that contain wires for electric service. With the approval of the Council, this inspector has the power to compel the joint use of poles or conduits by different interests, and no one is allowed to install poles or conduits for wires for any purpose, or equip any building electrically, or change existing equipment, without obtaining a permit from the electric inspector. Provisions of the National Electric Code will govern in all cases. The electric inspector has the power to shut off the electric current or remove wires when for any reason such live wires endanger life or property.

The accompanying cut shows one of the earlier types of Diehl motors that has been operating a sewing machine for 9 hours a day for more than 19 years in a Chicago carpet and rug factory. It has a ring armature that revolves outside of the field pieces. The company that owns and operates this motor says it has never been stopped for repairs or overhauling. Outside of supplying it with lubricating oil, the only expense it has put its owners to has been for new carbon brushes from time to time.



Diehl motor with external armature, in continual operation for 19 years without repairs or overhauling.

The city of Wilkes-Barre, Pa., has appointed A. Lewis, as inspector of electrical work. In future electrical contractors must obtain a permit for all work to be done, they must also be licensed, and all must pass an examination and will not be allowed to do any electrical contracting work without this license. All work is to be done in accordance with the new City Building Code.

Electrical contractors are invited to send replies to the following queries recently submitted to us by one of the fraternity located in the Middle West. The replies may be sent to this office. The queries are:

1. Is there any reliable formula by which electrical conduit jobs or knob and tube jobs can be estimated?

2. Concerning the last question, we mean data, taking on a number of jobs by companies (we think some must have done this) and reduced to an average. We want to know how the other fellows run their electrical contracting business. We know how we handle ours, but sometimes it dawns upon us that possibly we are not as wise as we think.

3. How about systems of checking in and out material? How can a manager's value in dollars and cents be reckoned, in fact, how is an electrical contractor's business properly managed from A to Z?

Joule's law shows that the heat developed in a conductor is directly proportional, first, to its resistance; second, to the square of the current strength; and, third, to the time during which the current flows.

Ohm's law expresses the relation between the three fundamental units of resistance, electrical pressure, and current. Expressed in terms of the units of the three quantities:

$$\text{Amperes} = \frac{\text{volts}}{\text{ohms}}$$

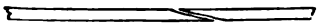
$$\text{Volts} = \text{amperes} \times \text{ohms}$$

$$\text{Ohms} = \frac{\text{volts}}{\text{amperes}}.$$

Two kinds of transmitters can be used in telephones, the magneto transmitter and the variable resistance transmitter. The magneto transmitter is a miniature alternating current electric generator which sends impulses of varying intensity through the line, the motive power being the sound waves generated by the voice or any noise. The variable resistance transmitter, unlike the magneto transmitter, is not a generator. What it does is to vary the strength of a current set up by another source.

Tungsten is used principally as an alloy of high-speed steel,—that is, steel used in making tools used in metal-turning lathes runing at high speed,—to which it imparts the property of holding temper at higher temperature than carbon steels will, according to the United States Geological Survey. The now well-known ductile tungsten is used for incandescent lamps, which are fast displacing carbon lamps. Recently greatly improved lamps, in which the wire is wound in helices and in which the globes are filled with nitrogen, have produced a close approach to white light. These lamps are furnished in candlepowers up to 2000.

When it is desirable to make a splice in an armature coil where large wire is used, says the M. W. Duntor Co., of Providence, R. I., bevel the wires as shown in the accompanying cut, and with Nokorode and solder, tin the surface. Then solder the wires together. If there is room the joint is improved by wrapping it with fine wire before soldering. After soldering, the splice is wrapped with insulating material.



Making a splice in an armature coil with the aid of Nokorode.

CONTRACTORS AND DEALERS NEWS

The Brice H. Reid Co., 211 South Main street, Elkhart, Ind., is wiring the new St. Joseph Valley Bank building at Elkhart. Conduit will be used throughout. The equipment includes a complete installation of Western Electric PBX private telephones. The ventilating system is operated by a 10-h.p. motor located in the rear of the bank, over the vaults. The various banking offices, vaults, and private offices, also the second and third floors will be equipped throughout with modern lighting apparatus.

Bremer & Lang, electrical contractors, 123 Liberty street, New York, have recently secured several contracts, among them being the rewiring of the old residence owned by Mr. Chapin, of Montclair, N. J., for 132 outlets, all BX armored cable, fixtures to be contracted for separately; also the wiring for Messrs. Ganz & Goodman's department store, for 130 X-Ray reflectors, the same as their Union Hill store.

The Beck Electric Kompany has moved from 204 Andrus Building to larger and more centrally located quarters at 1139 Plymouth Building, Minneapolis, Minn. The Beck Kompany reports the following contracts on hand: three 19 apartment buildings and two 4 apartment buildings; also the power installation of the Minneapolis Artificial Ice Co. This company also has the fixture contract for the Ely, Minnesota, high school, consisting of 188 General Electric fixtures for 200-watt nitrogen lamps, also 57 Brascolites for 200 and 300-watt nitrogen lamps.

G. Jordan, the electrical contractor of Virginia, Minn., reports the following contracts nearing completion: South Side School, a 2-story and basement fireproof structure, wired in conduit; the "White Way" at Olcott Park, and the South Side Park, both institutions being single light jobs equipped with nitrogen lamps.

The Olson-Boettger Electric Mfg. Co., of St. Paul, Minn., reports the following contracts on hand: Glen Lake Sanitarium at Glen Lake, Minn.; Chemistry Building of the University of South Dakota at Vermilion, South Dakota; high school at Montevideo, Minn.; boys' dormitory building at Crookston, Minn.; school for girls at Laux Center, Minn.; St. Mary's Hospital at Yankton, South Dakota; Home Economics Building of the University of Minnesota.

Farley Brothers Heating and Plumbing Co., 3607 East 12th street, Kansas City, Mo., have been awarded the contract for the wiring of a garage located at Sixth street and Grand avenue, Kansas City. This will be a conduit job throughout. This company is also installing the plumbing, heating, and electric wiring in the St. Anthony Orphan Home at Twenty-third and College streets, the contract price being $6,493. Other contracts include J. Tschudy's residence at 1022 West 54th Street terrace, the price being $6,057; a six apartment flat building to be erected at 4007-09 Harrison street for W. Wrenn; the electric wiring of the Royal Moving Picture Theatre, the contract price being $4,520. This is said to be the best equipped, best lighted, most beautiful and largest moving picture show between New York and Kansas City.

Farley Brothers have recently removed from 2113 East 15th street to 3607 East 12th street, Kansas City.

The Beattie Electrical Co., 324 East Fourth avenue, Cincinnati, Ohio, is wiring the new power building for the Union Distilling Co. It will be a conduit job for lights and small motors. The Beattie company also has the contract to equip electrically the chemical laboratory of the University of Cincinnati. This contract includes generators, switchboards, motor-generator balancer sets; wiring for lights, motors, clocks, and telephones; and making up of various testing laboratory instruments.

The Overton Electric Co., Main street, Riverhead, L. I., has the contract for the electrical work on a new dining pavilion at Palisade Interstate Park, Bear Mountain, N. Y. Here the wiring will be in rigid iron conduit for light and power, with 400 outlets for lighting. Over 100 double-pole local switches will be installed, also 100 h.p. of motors to be used for elevators, laundry machinery, and refrigeration plant. Special outlets for connecting plate warmers will be installed in the dining rooms.

W. A. Grimes & Co., La Crosse, Wis., have the contract for wiring the town of Harmony, Minn., for street lighting. There will be 44 single nitrogen lamp poles and a number of Cutter posts. This company is also wiring a number of business houses and residences in La Crosse.

A new electrical contracting concern at 304 State street, La Crosse, Wis., is called the Economy Electric Co.

A. H. Savage, 1003 Commerce Building, St. Paul, Minn., a contractor who makes a specialty of central station and underground cable work was formerly the St. Paul district manager for the Ft. Wayne Electric Works. He has just completed the contract for lighting the city of Sioux Falls, South Dakota.

The electrical equipment of the Lennox Furnace Co.'s new factory and central office building at Marshalltown, Iowa, will be taken care of by the Marshall

Electric Co., of that place. The offices will have ceiling lights controlled by flush switches; they will also have flush baseboard receptacles for the several electrical office appliances. The factory will be wired for 150-watt lamps with electrolier switches. The motor installation consists of 18 motors ranging in size from 1 h.p. to 25 h.p., the aggregate capacity of these motors being over 100 h.p. They will be of General Electric and Wagner make, operating on 3-phase, 60-cycle, 220-volt circuits. Throughout the factory the wiring will be in conduit, with knob and tube wiring in the offices. The offices will be lighted by 100-watt and 250 Brascolite units. Trumbull boards and panels will be used throughout.

The Electric Shop is the name of the new contracting and fixture house located at 730 College avenue, Appleton, Wis., owned and managed by Noble Z. Smith, who for a number of years conducted a contracting business at 450 Washington street, Appleton.

M. Hanson, 201 Pearl street, Green Bay, Wis., has the contract to wire the plant of the Northern Paper Mills. The contract also calls for Allis Chalmers motors aggregating 600 h.p. Another contract calls for the wiring of the new plant of the Ice Cream & Dairy Co. at Green Bay. Eight Fairbanks-Morris motors will be installed there.

The Lashway Electrical Co., of Chippewa Falls, Wis., has the contract for installing a 50-kw. hydraulic plant north of Chippewa Falls. The power will be used by farmers of the community.

The L. A. Witubees Electric Co., of Eau Claire, Wis., has the contract for wiring the plant of the Pioneer Furniture Co. There will be about 325 outlets and considerable power installation.

Clough's Electric Shop, of Rock Insland, Ill., has the contract for the complete electrical equipment of the new St. Anthony's Hospital at that place.

The wiring in the new Odd Fellows Temple at Jamestown, N. Y., will be done by the Jamestown Electric Co., 109 East 3d street, Jamestown. The lodge room will be lighted by the core system, the usual lighting equipment will be used elsewhere. This company has recently installed an indirect lighting system in a large local weave shed.

The Electrical Supply & Construction Co., 1728 North Second street, Vincennes, Ind., is installing a complete rigid conduit system in the Knox County Court House, at Vincennes. This building was put up a number of years ago and is massive in structure. The supply cable runs from a point 15 feet up the pole at the curb, underground 200 feet into the basement through 2-in. Sheraduct laid in 4-in. tile. Inside the building and as near the point of entering as practicable, the contractor placed the main line switch and fuses, thence to the feeder cabinet centrally located in basement. From the feeder cabinet are run the feeders to supply the various sub-cabinets. The lighting of the court room is arranged in two half circles, 21 lamps to each, placed in Type N. C. condulets trimmed with plaster rosettes. All other rooms have center openings equipped with 20-in. inverted bowl fixtures, containing Sunbeam nitrogen lamps operated by electrolier switches on side walls. Bracket lights are also conveniently located for all rooms. The glassware is the Delica white from the Pittsburgh Lamp Brass and Glass Co. The corridors and vestibules have 14-in. Delica white balls on 3-ft. chain pendants and Sunbeam nitrogen lamps. This company has recently finished the wiring of the Township School, at Washington, Ind., also six store buildings (Couchmann Block), at Bicknell, Ind. On the sidewalk in front of the Couchmann Block will be placed four 5-lamp ornamental poles.

The Hayes Electric Shop, 642 Fourth street, Santa Rosa, Cal., has recently installed six 2400-watt General Electric heaters in the hall for the Moose Lodge at Santa Rosa. The dimensions of the hall are 35 by 70 by 15 feet.

The James Corr Electric Co., of Omaha, Nebr., is looking after the electrical work in the new motion picture theater at 16th and Binney streets, Omaha. This theater is equipped with a motor-generator set for converting alternating into direct current. The lighting system calls for eight 24-inch indirect bowls, and 150 decorative lamps on the outside. All the wiring will be in conduit.

The A. C. Electric Co., 222 Fourth street, Milwaukee, Wis., has the contract to wire the new theater and office building now being erected by the Investment Service Co., at 27th and Center streets, Milwaukee. This is a $35,000 building.

The F. W. Korff Electric Co., of Lockport, N. Y., has been awarded the contract for the electric work in the new three-story and basement high school of Lockport. The installation consists of a complete conduit system for lighting, signaling, and power, with seven motors from 3 to 30 h.p. This installation is unusual in that three different kinds of current will be used, viz. 110- and 220-volt direct; 110- and 220-volt, 60-cycle, alternating, and 220-volt, 3-phase, 25-cycle alternating. This company has also been awarded the contract for the wiring of the new Newfane high school, at Newfane, N. Y.

James G. Mitchell, 2637 South 15th street, Philadelphia, Pa., has the following electrical contracts in hand: new clubhouse for the L. O. O. Moose, 1312 North Broad street, Philadelphia—an all conduit job including 1,200 lights, all fixtures, motors, telephones, and theatre wiring; new U. S. Post Office at Carnegie, Pa.—an all conduit job; new U. S. Post Office at Corry, Pa.—another all conduit job. Mr. Mitchell says: "I am estimating on more work this year than last, notwithstanding the fact that everyone is crying hard times."

The Electric Construction Co., of Sioux Falls, South Dakota, is wiring the Flandro High School for intercommunicating telephones at Flandro, South Dakota. This company also has the complete wiring job for the Bishop Hare Memorial building, of Sioux Falls, South Dakota.

A. C. Cameron, Oshawa, Ontario, has closed a contract with the corporation of Bowmanville, Ontario, for a new fire alarm system. It will be installed some time this month. A contract for extensions to the present fire alarm system has just been awarded to Mr. Cameron by the town of Oshawa. He has charge of this system, and is under contract to keep it in working order. He makes a specialty of fire alarm systems. He says he finds plenty of profitable work in his part of the country.

Electrical contracts covering the boys' high school, the Garland street school, and the 25th and A street school, at Louisville, Ky., have been awarded to the Neal Electric Co., 207 South 6th street, Louisville. The contracts include telephone systems, clock and program systems, vacuum cleaner systems, and electric wiring. The three contracts amount to about $16,000.

The McKeever Electric Co., 99 North Third street, Columbus, Ohio, has the contract for installing the electric work in a new grade school in Glenwood avenue, Marion, Ohio. This will consist of installing all wires for the electric lighting and power equipment and also for a return call bell system and a telephone system. The contract for the lighting fixtures will be awarded later.

The Brill Electric Co., Spartanburg, S. C., has the contract for the electrical equipment of the First National Bank building, at Spartanburg. The contract covers wiring in rigid, conduit and B X conduit for lights and telephones, and installation of fixtures. This company has recently moved to larger and more central quarters.

E. H. Roth, 75 North Main street, Wilkes-Barre, Pa., reports the following contracts in hand: a three-story building in South Main street, Wilkes-Barre; Union National Bank, Scranton, including motors for electric elevators, special automatic fire service pump, and telephones; office and bank building for the Wyoming National Bank, of Wilkes-Barre.

The Iowa Electric & Machinery Co., of Waterloo, Iowa, has the contract to wire the Levitt & Johnson Bank Building, at Waterloo, a ten-story, fireproof building wired in conduit for light and power.

A. Edgar Goetz, 51 Barclay street, New York, has contracts to install the electric lighting equipment for the clock in the New York *Tribune* tower, also in the MacNiff Horticultural Co., 54 Vesey street, New York. The *Tribune* tower will be lighted with nitrogen lamps equipped with a special parabolic reflector 22 inches in diameter. These reflectors are made of steel, white enameled, and will throw all the light on the face of the dial. Four 250-watt nitrogen lamps will be used, one for each dial. Provision has been made to use color effects on the clock on holidays, color screens being placed in front of the nitrogen lamps for this purpose. On such occasions 500-watt nitrogen lamps will be used. The auction room of the MacNiff Horticultural Co. is lighted with six 350-watt nitrogen lamps suspended from a 30-foot ceiling. The basement is equipped with drop lights.

The Norwich Electric Co., 100 Franklin street, Norwich, Conn., has just completed the installation of electric lights and power in the Thayer Building, Norwich, Conn. This is a four-story and basement, reinforced concrete building and all wiring is in iron conduit, concealed. There are fifty-four offices and four large stores. One three-light Miller chandelier, equipped with 60-watt Bryan-Marsh mazda lamps and Parian shades, furnishes the illumination for each office. Each store is lighted by four Parian inverted 16 in. bowls equipped with 150-watt lamps. The result is a soft diffused light of excellent quality and sufficient candle power. Specially designed two-light fixtures illumine each window, and the halls and corridor are illuminated by 60-watt lamps and are in 10 in. crystal rough inside balls, supported by 5 in. ceiling rings.

The Certified Farms Co., 26 West 59th street, New York, has opened a branch store at 39 Barclay street, New York, and is equipping its sidewalk elevator with electric power. It is also installing new semi-indirect lighting fixtures. A. Edgar Goetz, 51 Barclay street, New York, has the contract.

The Southwestern Electric Co., 4121 Charlotte street, Kansas City, Mo., has finished rewiring the new front of the Regal Shoe Co., at 1116 Walnut street, Kansas City. X-ray reflectors were installed in the show windows and cases. This concern is now wiring and installing fixtures in six bungalows now building for H. L. Bliss at 44th and Virginia streets, Kansas City.

H. Robowski, electrical contractor, at Cherokee, Iowa, reports the following contracts under way: Security National Bank and office building, and the Cherokee State Bank building, also the Methodist church—all wired for light and power. The fixtures will also be furnished by this company.

The Columbia Electric Engineering Co., 309 Washington street, Boston, has the contract to furnish the entire electric equipment for the F. W. Woolworth Co.'s new building, Central Square, East Boston, Mass. The entire lighting fixtures will be the same as in general use in all their large stores. The decorative lighting will consist of cornice lights entire length of building. Signs will be lighted by eight 750-watt nitrogen lamps. The store will be equipped with interior telephones, ozonators, and modern system of ventilation. The Woolworth stores are now using nitrogen lamps for interior lighting, and the outlets are laid out over each counter, giving most effective results. The building is also to be equipped with ceiling fans.

Puehler & Ganecke Co., 1920 Vliet street, Milwaukee, Wis., have the contract for wiring the Wayne apartment house, for vacuum cleaner, telephone systems, and lights.

D. B. Van Fleit, Garrett, Ind., is wiring a two-story and basement residence for W. T. Egan at Garrett, Ind.; this will be a part conduit and knob and tube job, the fixtures will be semi-indirect. He has just completed the wiring of a three-story and basement hotel at Butler, Ind., also the Carnegie Library at that place, both installations are part conduit and knob and tube jobs. The prospects for the coming season in the building line are good in that section, he says.

E. H. Richter has taken over the management of the Natrich Electric Co., of 1416 Broadway, New York, and has changed its name to the Ellrich Electric Co. The office of the Ellrich Electric Co. will remain at 1416 Broadway. The shop is located at 157 West 30th street.

GLEANINGS FROM THE N.E.L.A. QUESTION BOX

Reprinted from the Bulletin of the National Electric Light Association.

Where cables are trained around the walls of a manhole on cable racks is it not advisable to use insulating supports even though the cable sheaths are bonded together and grounded to a ground rod? The point is, is it not advisable to restrict stray currents so far as possible to paths where all contacts are good rather than to have leakage at points of imperfect contact? The conduits between manholes are vitrified tile.

Ivor L. Kentish-Rankin—Most of the trouble from electrolysis occurs in moist places in the ducts. If the cables are bonded together and thoroughly grounded at the manholes, the path through the cable supports to ground should not cause any trouble because they are in parallel with the low-resistance bond wire, while the sides of the manholes, of brick or cement in which the cable supports are embedded, offer a certain amount of resistance which still further tends to shunt the current through the bond wire.

A covering of cement is often plastered round the cables in the manholes. Such an armor offers considerable protection to the lead from fire, from twisting and bending, and from rough usage in general, while it has the added advantage of being quite a good insulator. The cost of covering cables with cement, which should not exceed two cents a foot for the largest cables, is fully justified for any one of the reasons given. The best way to apply the covering is to wrap rope ¼ in. in diameter spirally round the cable, the centers being about ½ in. apart and then apply a mixture of one part cement and two parts sand.

F. B. Lewis—Where cables are trained around the walls of a manhole on cable racks it is advisable to support them on wooden blocks. We believe that nothing but a thoroughly good contact should be made with any metal, both from the standpoint of current leakage, such as electrolysis, and also on account of possible crystallization, which might occur when the cable is in contact with metal and where it is likely to be subjected to vibration, as is invariably the case in manholes because of the street traffic.

G. R. Smith—It has been found that in cases of serious burn-outs on power cables, the trouble on one cable often travels by way of hangers of defective cable and stanchion to those supporting the adjoining cables. A porcelain cable rack having pillars upon which the cables rest interposes a heavy insulator to the spread of this kind of trouble. In the greater number of cases of trouble from electrolysis, the underground cable receives or discharges stray currents on the sheath through the medium of the stanchion or rack.

I am anxious to get a list of all cities that make a difference in rate between direct-current and alternating-current service. At present Toronto is the only one known to me.

C. S. Walton—The rates in Los Angeles city are fixed annually by its Board of Public Utilities. For several years past a charge of 10 per cent. over the rate fixed for alternating-current service has been made for all direct-current, 110, 220 and 500-volt service. This charge is paid by the customer apparently without objection. The 110-220-volt service is confined to the business or conduit area of the city; the 500-volt service extends two or three miles into the residence and apartment house sections, which are served from overhead systems.

Will some member company kindly explain to us the best and cheapest method of protecting from lightning a 10-mile, 6600-volt, 3-phase, 60-cycle transmission line?

Ivor L. Kentish-Rankin—There is only one method in vogue for the protection of the transmission line itself, and that is the overhead grounded conductor. While the overhead grounded conductor offers a most effective means of protecting the high-tension line from induced charges it is practically useless against a direct lightning stroke. In fact there is no form of protective device that offers protection against a direct stroke.

With any line endeavor should be made to insulate as highly as possible with arresters installed between line and station apparatus. The arrester should be the weakest part, offering the easiest discharge path of the system.

In any case aluminum arresters should be used between the line and the apparatus as they are the only type of arrester that will, with any degree of certainty, discharge lightning of large amounts of energy at moderate frequency and wave front, which is the condition met in the majority of cases. The function of the arrester is to protect the equipment from surges, etc., rather than protect the line. Lightning is, as a rule, of such steep wave front that the effect is so highly localized that it dissipates itself by shattering and spilling-over insulators long before it can reach the arrester. As would be expected, low-voltage lines suffer more than high-voltage lines, therefore, the best protection may be obtained by having the line insulated as highly as possible, with one or more overhead ground conductors installed. Arresters of the electrolytic type should of course, be installed as well to protect station apparatus.

How much money may justifiably be spent on protection depends upon the value of the equipment to be protected, the cost of service interruptions and the severity and frequency of lightning strokes.

F. E. Ricketts—The best method of protecting from lightning a transmission line of the character described is to connect to the line a suitable number of lightning arresters, preferably of the electrolytic type. The proper arrangement of the arresters would be, one at each end of the line and others distributed along the line at points most exposed to lightning disturbances.

In the bulletin issued by a prominent lamp manufacturer we find the statement that mazda lamps should not be placed in series with arc lamps unless compensator arc lamps are employed. What has been the experience of member companies in this regard?

L. M. Klauber—We have a few incandescent lamps inserted directly in 6.6-amp. series circuits supplying approximately 100 enclosed carbon arcs each. These lamps have shown normal life. We have another installation wherein a series circuit supplying 80 6-6-amp. enclosed carbon arcs also supplies 110, 60-c.p. and 12 100-c.p., 6.6-amp. series mazda lamps. These lamps are not connected directly in the arc circuit but are connected to the secondaries of G. E. Type S L current transformers, having a ratio of 6.6 to 6.6 amp., the primaries of which transformers are connected in series with the arc lamps. For this installation of incandescent lamps four 2-kw. transformers are used. The transformers were installed primarily to insulate the incandescent series systems from the high voltage arc series system, thus permitting the incandescent wires to be carried on the secondary cross-arms. The lamp life secured in this installation has thus far been found to be in excess of the rating of 1350 hours. We are not aware to what extent, if any, the use of these series transformers has protected the lamps in the secondary circuits from excess current surges existing in the primary.

It should be stated that the lamps in question are of the vacuum and not of the gas-filled type. These are, according to the manufacturers, not so susceptible to diminished life due to excess current surges as are the newer lamps, as they are not operated so nearly at the melting point of the filament.

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(1) *Are employees instructed to kill all high voltage circuits before using a fire hose in their vicinity?*

(2) *Is it safe to direct a fire stream against a* 150,000 *or* 44,000 *volt conductor?*

(3) *Are chemical extinguishers placed in electric plants or in buildings nearby and if so, what means are taken to prevent their being used on live circuits.*

(4) *Are one quart extinguishers which use carbon tetrachloride or similar liquids as valuable as sand in putting out small fires?*

(5) *Has it not been found that station attendants in attempting to extinguish fires with carbon tetrachloride extinguishers, not only lose valuable time but also fill the station with noxious gases so that it is difficult to fight the fire by other means?*

E. D. Edmonston—So-called "pyrene" fluid, carbon tetrachloride, tri-chlorethylene and such other chlorine derivatives, are of high insulating quality and are efficient fire extinguishers. They can be safely used in fighting fires around or in live electrical conductors and apparatus, and where it would not be safe to use water. Because of the chlorine gas, however, which is given off from such chemicals when brought into contact with heat and which is the active element in the extinguishing, it is not well to use such chemicals in close basements or pits where the person handling the extinguisher would not be able to get good air. In such places sand should be used in fighting electrical fires or fires adjacent to live electrical conductors.

Why are transformers painted black. It would seem that where they are exposed to the sun their capacity would be reduced by this practice. If they were painted white they would reflect the sun's heat instead of absorbing it.

L. Anciaux—The chief reasons for their being painted black are cheapness, inconspicuousness and the concealment of dirt and oil stains. Formerly all our transformers were installed painted black as received from the factory, but we have found that in a tropical climate where the sun's rays are practically direct throughout the year it is of considerable advantage to paint them white, and all are being gradually so painted.

It is necessary to give a preliminary coat of varnish to prevent the black from working out, and a little bluing in the white paint improves it considerably.

I have noticed that the series field windings of compound-wound, direct-current motors always have the series windings placed next to the yoke, and the shunt windings at the pole tips. Is there any special reason for this, and what difference would it make if the positions of the shunt and series windings were interchanged.

J. L. Harvey—The only reason for placing the series field coils next to the yoke is the fact that there is more space available there than at the pole tips. Moreover, placing the series coils near the pole tips would interfere somewhat with ventilation.

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(1) *What has been the experience of member companies in the use of protective devices on electric services?*

(2) *Is the expense justified on all services, business and residential?*

(3) *Has any company required owners to furnish proper protective devices as part of their interior wiring?*

G. R. Smith—The subject of protection is often disposed of by those in charge of the department concerned without proper consideration of the facts, principally on the ground that the amount of unmetered current consumed would not warrant the expense of additional equipment. While it is difficult to determine the amount of energy diverted from a meter it is conceded by many to be considerable. The following instances recently called to our attention will serve as illustrations:

A central station in the East having some 8,000 meters in service all of which were finally equipped with protective devices has succeeded in reducing its "unaccounted for losses" more than 50 per cent. The saving effected was sufficient to cover the cost of the protective devices in a comparatively short time.

In a city of 100,000 inhabitants in the Southwest the central station caused an inspection of installations to be made by a special man who actually detected over 300 cases of tampering in a period of three months. This resulted in the installation of protective devices.

Companies install protective devices usually because of suspicion and once begun each new meter is equipped as a part of the standard installation. It is considered good policy for the central station to retain ownership in apparatus of this kind although some require the user to bear a part of the expense, especially of the protective switch or cut-out. Generally, however, this is a matter to be determined by local policy. A service switch so constructed that the customer may renew blown fuses without the possibility of tampering is a good thing.

Will member companies operating plants of from one to 5000 horsepower, and using water-tube boilers and steam turbines, kindly inform us what help they employ for the boiler and turbine room? What would be a reasonable allowance per h.p. for boiler repairs in a plant containing four 500-h.p. boilers?

J. B. Crane—In operating a plant with two 750-kw. steam turbines, we employ,

One engineer, Six firemen,
Two shift engineers,
One helper,

These men operate on 12-hour shifts. The boiler plant consists of three 300-h.p. water-tube boilers.

RECENT LEGAL DECISIONS

Of Special Interest to Electric Light and Power Stations

Purchase of Light Plant—Consideration

Where it was held that there was sufficient testimony to support a finding of the trial court that a part of the amount ($2,200), named as the consideration ($14,000) of a contract for the purchase by a city of a light plant, or a part of the same, which had been owned and operated by a private light and power company, was paid by the city to such company for the surrender of an unexpired part, namely 6 years, of an exclusive franchise previously granted to the company by the city fon 20 years, the court approved the contract so far as concerned the material and fixtures, and it set aside that part of it providing for the purchase of the unexpired franchise and good will at $2,200.

State v. City of Stafford, Kansas Supreme Court, 140 Pac. 868.

Guy Wires in Highways—Evidence of Proximate Cause of Injuries

A telephone company is not a trespasser upon the highway nor negligent per se in maintaining a guy wire upon that portion of the public highway not intended for the public, under Montana Rev. Codes, §4400, giving to a telephone company the right to construct its lines along the public highways of the state, and to erect on such highways, posts, piers, and other necessary structures, with this restriction, that the public shall not be endangered or inconvenienced in the use of the highways thereby. In the present instance the utmost that could be said of the company's act in attaching its guy wire so near the traveled roadway was that it was a question for the jury whether it constituted negligence. At the time the plaintiff came in contact with the guy wire she was driving outside the graded or traveled portion of the highway. A wheel of her buggy struck the wire, so frightening her horse that it ran away. There was no explanation as to how the plantiff came to be driving outside the traveled portion of the highway. It was held that it could not be determined whether the negligence of the company in placing the wire so near the road, or whether the plaintiff's negligence in leaving the traveled portion of the highway, was the proximate cause of the injury, and she could not recover.

Howard v. Flathead Independent Telephone Co., Montana Supreme Court, 141 Pac. 153.

Liability for Broken Wire in Highway—Notice

In an action against an electric light company to recover damages for personal injuries to a pedestrian, caused by contact with a broken wire in a highway, an averment in the statement that the defendant had permitted its wire to be for a long time prior to the injury in a broken and defective condition in and along the highway, was held to be borne out by proof properly admitted that if the plant of the defendant company had been equipped with the necessary devices, commonly known and in general use, those in charge of the plant would have had immediate notice of the breaking of the wire, and could at once have turned off the current. In such a case it was no defense to show that the defendant had been paid by some customer to put up the wire in question, and that the customer had agreed to notify the company in case a dangerous condition should such arise.

Zinkiewicz v. Citizens' Electric & Illuminating Co., 53 Pennsylvania Supreme Court 572.

Construction of Contract to Furnish Electric Current

A written contract provided that the owner of an electric power plant should furnish at its power house "a current of not to exceed 300 electric horsepower" for a consideration received. It was held that the contract could not be construed to require the furnishing of three or more times such current when necessary to start a certain type of motor, although such motors were in use by the other party when the contract was made, and it was known that the current was to be used for their operation, but the necessity of a large additional current for starting purposes was not anticipated or thought of by either party.

Alaska Treadwell G. M. Co. v. Alaska Gastineau M. Co., C. C. A., 214 Fed. 718.

Injuries from Flowage—Injunction

In an action to enjoin the defendant power company from flooding the plaintiff's lands with its dam, it appeared that the plaintiff purchased the land with the knowledge that a portion of it, consisting of barren, perpendicular rock, was flooded by the dam, which had been constructed by the defendant at great expense and for the purpose of supplying electricity for public and private use, and the damage to the land seemed inconsiderable. It was held that equity would not grant a mandatory injunction.

McCann v. Chasm Power Co., 211 N. Y. 301, 105 N. E. 416.

Exercise of Power of Eminent Domain by Foreign Corporation

A foreign corporation organized to produce and supply to the public light, heat, power, and any other thing to which electricity or other form of energy is now or may hereafter be applied, has authority to construct, maintain and operate utilities, plants, and machinery to generate electricity by water power artificially created, and to transmit electric power so generated.

Where the object of a corporation seeking to condemn a dam and lands is to acquire water power for the generation of electricity for distribution to the public for light, heat, and power, the use for which the property is sought to be taken is public. The state, it is held, may authorize a foreign corporation, lawfully empowered to promote a public use, to exercise the power of eminent domain, and may confer the right to take the property of a corporation already condemned under the power of eminent domain. Where the use for which property is sought to be condemned is public, the judgment of the legislature as to the expediency of authorizing the exercise of the power is conclusive and will not be considered by the courts; the policy of a statute being no concern of the courts. The validity of a statute conferring the power to condemn property for a public use, and requiring compensation therefor, may be attacked only on the ground that the statute on its face is too indefinite or uncertain to be administered, or the power intended to be conferred, to be practically utilized, or that it illegally discriminates between members of the same class.

Alabama Interstate Power Co. v. Mt. Vernon-Woodberry C. D. Co., Alabama Supreme Court, 65 So. 287.

Wires Passing Through Trees—Injuries to Children

A boy of 12 climbed a tree in the street and came in contact with a high-tension electric wire passing through the branches. He received a shock from a portion of the wire that had become uninsulated by friction against the tree, resulting in his death. In an action, therefore, it was held that the fact that the boy was a trespasser was immaterial to the electric company's liability. It was also held that the company was bound to take notice of the habit of boys to climb such trees, and was guilty of actionable negligence.

Benton v. North Carolina Public Service Co., North Carolina Supreme Court, 81 S. E. 448.

Statutory Provisions as to Live Wires

Under the provisions of the Oregon Employers' Liability Act as to insulation of wires, the separation of live from dead wires, the marking of supports of live wires, etc., it is held that the furnishing of switches at some distance from a point where work is required to be done, by which the current may be turned off entirely, does not exculpate an electrical company from negligence in failing to comply with the specific requirements of the statute. Electricity is a dangerous element, and in its use the Oregon courts hold that the highest degree of care is required to protect employees and the public.

McClaugherty v. Rogue River Electric Co., Oregon Supreme Court, 140 Pac. 64.

Franchises—Conditions—Forfeiture

Under the Washington statute, Rem. & Bal. Code, sec. 7507, subd. 7, authorizing cities of the first class to regulate the use of the streets, to authorize or prohibit the use of electricity at, in, or on any of the streets, and to prescribe the conditions on which the same may be used, and regulate the use thereof, it is held that a city of the first class, in granting a franchise to a corporation to use the streets to furnish electricity for power and heat, was authorized to impose as a condition that it should not furnish electricity for lighting or generating electricity for lighting, and providing that the franchise should be void and subject to forfeiture in case of a breach of such condition. Such a condition was not abrogated by the Public Service Commission Law, which deals only with questions of safety, efficiency, rates, and equality of public service. Where a franchise provided that it should be void in case of the grantee's failure to perform any of the conditions specified, and if the failure be not corrected within 30 days after notice, the franchise should be terminated and the grantee's property forfeited to the city, it was held that the grantee's failure to cease furnishing electricity to a railroad company for lighting for more than 30 days after notice to desist was ground for termination of the franchise and forfeiture of the property. Evidence that it would cost the railroad company from $1,000 to $1,500 to readjust its system so as to take power for lights from the city instead of from the power company was held to be immaterial.

Tacoma Ry. & Power Co. v. City of Tacoma, Washington Supreme Court, 140 Pac. 565.

High-Tension Wires—Proximity to Telephone Wires

A railroad company strung three uninsulated high-tension wires for the operation of its electric railroad 15 to 18 inches above certain telephone wires which had been erected for many years. A telephone lineman, in repairing the telephone wires, came in contact with the high-tension wires, and sustained fatal injuries. In an action for his death it was held that a jury would be justified in finding that to string such high-tension wires so close to telephone wires as was done here was negligence. The question whether the lineman was negligent in coming in contact with the wires was held to be for the jury. There was no eyewitness to the injury, and, in the absence of evidence to the contrary, there was a presumption that the deceased was in the exercise of ordinary care. There being no contract relations between the lineman and the railroad company, the lineman did not assume the risk of contact with the company's high-tension wires while repairing the telephone wires. The railroad company permitted the use of the wires by a power company for the distribution of power, not only to the railroad company, but to others. It was held that both the railroad company and the power company were liable for the death of the lineman.

Teachout v. Grand Rapids G. H. & M. Ry. Co., Michigan Supreme Court, 146 N. W. 241.

Failure to Use Rubber Gloves—Assumption of Risk

An experienced electrician was one of a gang of men employed in removing certain electric light and power wires from one pole to another on a clear, dry day. While engaged in this work he received a shock which killed him. An action for wrongful death was based entirely upon the fact that the defendant power company, his employer, did not shut off its current while the deceased was working on the wires. There was evidence that it was not customary nor necessary to do so; that the employees stood no possible danger of any injury in this work if they followed the directions of their employer and properly used the instrumentalities furnished them for their safety; that if the deceased had used the rubber gloves furnished him by the company, he would not have been hurt. He knew that he could work in perfect safety upon any one of the wires, no matter how high the voltage, if he did not let himself come in contact with other wires, thus making a short circuit. It was held that he assumed the risk as matter of law, and there could be no recovery for his death.

Register v. Tidewater Power Co., North Carolina Supreme Court, 81 S. E. 326.

MANUFACTURERS' NEWS

The Usona Mfg. Co., Inc., has been granted charters under the laws of the states of New York and Ohio, with eastern offices at No. 1 Hudson street, New York, and western offices at No. 1012 Monroe street, Toledo, Ohio, for the purpose of manufacturing and selling flashlight cases, batteries, lamps, and battery lanterns. The incorporators of the New York company are Geo. G. Beers, Frank Stout, and Wm. Carell, all of New York.

The Titan Storage Battery Co., of Newark, has changed its name to the General Lead Batteries Co.

The Minerallac Electric Co., 400 South Hoyne avenue, Chicago, will hereafter manufacture the Altman portable desk push button formerly made by Altman & Co., of Chicago.

The Fairmount Electric & Mfg. Co., Philadelphia, Pa., has changed its address from 2202 Pearl street to 59th street and Woodland avenue.

The Thordarson Electric Mfg. Co., 501 S. Jefferson street, Chicago, has been reorganized. J. A. Bennan and A. R. Johnson are no longer associated with the company. M. W. Dingwall has been elected general manager, and is in charge of the sales department.

The Coil Mfg. & Repair Co., 1011 Power avenue, N. E., Cleveland, Ohio, has bought the factory and equipment of the Cleveland Coil and Mfg. Co., and will manufacture armature, field, and induction motor coils. R. P. Roscoe will manage the new company.

At the recent annual meeting of the General Insulate Co., 1008 Atlantic avenue, Brooklyn, N. Y., the following officers were re-elected: Joseph Steinberger, president; E. J. Koltenbach, vice-president; James G. Stephens, treasurer; V. C. Steinberger, secretary and manager. The company reports a bright outlook for this year, orders now coming in from all directions.

The cut of the portable alternating testing volt-ammeter made by the Roller-Smith Co., 203 Broadway, New York and shown on page 18 of our February issue, was not a full sized replica, as stated. The size was slightly reduced so as to accommodate it to the horizontal measure of our columns.

J. A. Bennan, treasurer and general manager of the Thordarson Electric Mfg. Co. since its incorporation, has recently resigned from that position and incorporated the Jefferson Electric Mfg. Co., located at 847-851 West Harrison street, Chicago. The new company will manufacture a complete line of bell ringing, toy, sign lighting, and welding transformers, battery switches, steel battery box outfits, make and break and jump spark ignition coils, and a line of high tension transformers for testing, laboratory, and research work.

The St. Louis Malleable Casting Co., 7701 N. Conduit avenue, St. Louis, Mo., has just issued a new catalogue on pole and line hardware.

The Fort Pitt Steel Casting Co., of McKeesport, Pa., is at present buying power, but will soon put in a private plant.

The Robbins & Myers Co., of Springfield, Ohio, has begun manufacturing in the new addition to its plant. This building is 363 feet long and consists of 4 stories and basement. It is constructed of reinforced concrete and is equipped with sprinklers, hot water heating, and dust collecting systems. The basement houses the punch press department, bar stock storage, and heating plant. The first floor houses the shipping, screw machine, and shaft turning departments. The second floor is devoted to plating, polishing, finishing and fan machinery in stock. The third floor houses the fan assembly, detail machine department, and stock room. An experimental laboratory, stock room, and lecture room are contained on the fourth floor.

G. Brewer Griffin, formerly manager of the detail and supply sales department of the Westinghouse Electric & Mfg. Co., has been appointed manager of the new automobile equipment department of the company to which he will devote his entire time. So extensive has been the growth in the manufacture of starting, lighting, and ignition outfits for gasoline cars, that a separate department was organized by the Westinghouse company for the production and sale of automobile accessories.

The first self-winding "Klok" and bell ringing system installed by the Betts & Betts Corporation, 256 West 55th street, New York, is in the Wadleigh High School, at Amsterdam avenue and 104th street, New York. This company is now installing a master klok, 4-circuit program, and 62 individual secondaries in the Muncie High School, at Muncie, Ind.

The Evolution Phone Co., Inc., 3 East 14th street, New York, has been organized to deal in electrically operated Pape hearing devices. The company will soon market a line of these devices, about a dozen in all. The line will include portable electric earphones, table or desk electric earphones, and electric ear vigorators.

The present organization of the Ward Leonard Electric Co., of Bronxville, N. Y., was formed by H. Ward Leonard in 1892. The company was organized for the purpose of manufacturing electric controlling devices, and has continued in this line ever since. It is said to be the oldest concern in the world to-day which has specialized in electric controlling devices of all kinds. The officers of this company are: Leonard Kebler, president; D. J. Burns, vice-president; H. Ward Leonard, (recently deceased); Walter H. Mott, secretary-treasurer; A. E. Waller, production manager; George W. Camp, general superintendent.

The D. & W. Fuse Co., Providence, R. I., has issued a new catalogue describing its line of magnetic chucks. The combination of excellent half tone illustrations, Ben Day borders, new type, and cover of the latest shade of brown make an attractive pamphlet.

The 1915 catalogue of the Virden Mfg. Co., 6011 Longfellow avenue, Cleveland, Ohio, has just been issued. It contains 54 pages of text and illustrations showing the various lines of fixture parts and specialties made by this company.

The Chelten Electric Co., 314 Armat street, Philadelphia, Pa., shortly expects to have ready for the trade a full line of enclosed fuses of the ferrule type.

The Cutler-Hammer push button 660-watt brass shell socket is now furnished on the following well-known makes of portable lamp fixtures: the "Wallace," made by the Wallace Novelty Co., several models; the "Leindorf," made by the Leindorf Electric Light Co., Inc.; the "Vanitie," made by the Aladdin Lamp Corporation; the "Dale," made by the Dale Lighting Fixture Co., and the "Emeralite," made by the H. G. McFadden Co. The indicating push-button socket has been found particularly advantageous because of the small, neat design and the absence of the protruding rotary key. The small C-H electrolier socket is also in use on several styles made by some of the above makers of portables.

For the nine months ended December 31, 1914, the Westinghouse Electric & Mfg. Co., did a gross business of $26,278,076. After deducting fixed charges and miscellaneous expenses the net income available for dividends and other purposes amounted to $1,354,166.

Antoine Bournonville, who has been connected with the business of the late Alfred F. Moore, 200-218 North Third street, Philadelphia, for many years, resigned his position with that concern on February 15. The business will be continued as heretofore by the trustees of the estate.

In a lumber yard in upper New York, electricity unloads, conveys, and sorts the lumber. This yard is located on the East River, the lumber being brought in by boats which dock on either side of a slip built for this purpose. What is of particular interest is the method of throwing the lumber out into the yard streets at various points so that the electric hoists can pick it up and place it on the proper pile. To accomplish this magnetically operated remote controlled deflectors are used. These deflectors are operated by an attendant located so as to get a view of the conveyors and can thus close or open any deflector desired. The lumber is unloaded from the boats by means of electric hoists and is also picked up from the street, where it is thrown by the deflectors and carried to the lumber piles. Cutler-Hammer apparatus is used throughout.

BRANCH OFFICES AND AGENCIES

Do you want an agent? If so, we will put the notice here free. The same privilege is extended to agents desiring to represent manufacturers.

On page 186 our readers will find an advertising section, giving the local address and telephone number of manufacturers' agents and branch offices of out of town concerns. The constant inquiries coming to the ELECTRICAL RECORD for this information caused this section to be started. It will be found especially useful by persons wanting immediate information. As a time saver it will be appreciated.

The Despatch Mfg. Co., 104 North Second street, Minneapolis, Minn., is looking for agents to handle its portable electric room heaters, electric ovens, and other heating appliances.

The Chelten Electric Co., 314 Armat street, Philadelphia, Pa., is looking for an active manufacturers' agent to represent it in New Orleans. The company seeks an agent who will cover not only New Orleans, but most of the state of Louisiana.

The Knape Mueller Co., 202 M. & M. Building, Milwaukee, Wis., wishes to represent manufacturers of domestic or imported wire, also porcelain, in that part of the country.

The M. N. Sweet Co., manufacturers' agents, located for ten years at 503-505 Ellicott Square, Buffalo, N. Y., want electrical lines on commission basis east and west from Buffalo.

Charles Farnham, 207 I. W. Hellman Building, Los Angeles, Cal., is the Southern California representative of the Pacific Electric Mfg. Co., of San Francisco, the G. & W. Electric Specialty Co., of Chicago, and the Continental Fibre Co., of Newark, Delaware. In addition to these lines, he wishes to cover Southern California for manufacturers of varnished cambric insulation, lead encased wires, and flexible armored cables. He does business with power companies, railways, towns, and the U. S. Government.

The Victor Storage Battery Co., of Rock Island, Ill., is open for manufacturers' agents to handle their light and power, also portable ignition batteries, in all territories.

Roger Williams, agent for the Simplex Electric Heating Co. in New York, has moved from 25 West 42d street, to 120 West 32d street.

W. P. Naser has been appointed Pacific Coast representative of the Trumbull Electric Mfg. Co., Plainville, Conn., and has opened offices at 595 Mission street, San Francisco, Cal.

The Chelten Electric Co., 314 Armat street, Philadelphia, Pa., has recently appointed W. G. Williams, formerly of the Stuart-Howland Co., as their agent to cover the states of Maryland, North Carolina, and the greater part of Virginia.

The Electric Operations Co., Bush Terminal, Brooklyn, N. Y., has been appointed eastern representatives by the Oshkosh Mfg. Co., of Oshkosh, Wis., manufacturers of construction tools for telegraph, telephone, and railway lines. A complete stock of these tools will be kept on hand at the Bush Terminal.

The Electric Controller and Mfg. Co., Cleveland, O., announces that the O. H. Davidson Equipment Co., Ideal Building, Denver, Colo., will act as its representative in Colorado, Utah, Montana, Wyoming, South Dakota, New Mexico, and Arizona.

Wm. P. Cochran, formerly head of the industrial and power department of the Baltimore office of the Westinghouse Electric & Mfg. Co., has been appointed branch manager of the Baltimore office, which has been consolidated with the Philadelphia office of the company. H. H. Seabrook, formerly manager of the Baltimore office, is now manager of the consolidated territory, with headquarters at Philadelphia.

American Manufacturers' Agency, Inc., 111 Monroe street, Chicago, has taken the agency for the Trio Mfg. Co.'s (Rock Island, Ill.) line of switches and panel boards.

Increasing demand on the Pacific Coast for the products of the Beacon Miniature Electric Co., 108 Duane street, New York, has induced that company to open a branch office at 156 Second street, San Francisco, California. A complete line of Beacon products will be kept in stock there.

The R. Thomas & Sons Co., 61 Broadway, New York, manufacturers of high voltage insulators and special porcelains, have added to their selling force. Robt. H. Anthony, of Boston, who is well known throughout New England. The main office and factory is located at East Liverpool, Ohio.

C. W. Gallup, for a number of years connected with the General Electric Co., as wiring device specialist, has severed his connection with that company and is representing The Central Electric Co., of Chicago, Ill., in Nebraska, Wyoming, and South Dakota. His headquarters are at the Hotel Lindell, Lincoln, Neb.

The Adams-Bagnall Electric Co., Cleveland, Ohio, has appointed V. M. Marker in charge of its Chicago office. Mr. Marker was formerly in charge of the Minneapolis office of the company. He will still have supervision over the Northwestern territory besides that covered by the Chicago office, his district extending from Chicago to the Pacific Coast.

E. W. Donaho, formerly Chicago salesman for the Hotpoint Electric Heating Co., at Chicago, has accepted a position with Landers, Frary & Clark, New Britain, Conn. He will handle the electrical appliance trade of the latter firm in the Chicago territory.

A. B. Saurman, for the past twelve years Pacific Coast manager for the Standard Underground Cable Co., of Pittsburgh, has been appointed Southeastern manager of the company to succeed the late T. E. Hughes. He will return east in the early spring, and be located in his native city, Philadelphia, Pa. Mr. Saurman has been connected with the Standard Underground Cable Co. for over 21 years. John P. Bell will succeed Mr. Saurman as Pacific Coast manager. For the past eight years Mr. Bell has been the assistant secretary and treasurer of the company. R. M. Hirst and Edward Kershner will continue in the Philadelphia office territory. S. S. Warner will continue at the Atlanta sub-office.

The Electrical Products Co., 253 Broadway, New York, is the Eastern representative of the Luminous Unit Co., of St. Louis, Mo.

W. N. Matthews & Bro., Inc., 3705 Forest Park boulevard, St. Louis, Mo., have opened a district office in the Ideal Building, Denver, Colo., with O. H. Davidson in charge. Mr. Davidson will carry a complete line of Matthews specialties, and will cover the states of Colorado, Utah, Wyoming, Montana, Idaho, and western South Dakota. W. N. Matthews & Brother have other district offices, as follows: 30 Church street, New York, W. H. Heim in charge; 507 So. Clinton street, Chicago, W. E. Bischoff in charge; 629 Howard street, San Francisco, L. E. Sperry in charge.

JOBBERS AND DEALERS

The Orcott Co., 312 Nebraska street, Sioux City, Iowa, known as a hardware jobber, is opening up an electrical supply department and would like to hear from manufacturers of electrical supplies, fixtures, and devices.

The General Gas & Electric Co., which does a jobbing business, is now located in its new building at 318 Market street, Philadelphia, Pa. This is a three-story building with 10,000 square feet of floor space. The building is owned by the above named company.

Superior, Wisconsin, a live, progressive town, invites some enterprising electrical jobber to make that place his headquarters to supply the growing local trade in electrical goods. In lieu of a local jobber, it invites one of the big jobbing houses to open a branch shop there. Inquiries should be addressed to Riley S. Hartley, electrical contractor, Superior, Wis.

O. Friedrich Rost has been elected to the office of treasurer and general manager of the Newark Electrical Supply Co., to fill the vacancy caused by the death of Phillip H. Rutter. The business policy of the company will not be changed. Mrs. Emma Mills-Rost retains her majority financial holdings, and will act as president of the company.

L. F. Neer Co. has opened an electrical and automobile supply store at 147 West State street, Fremont, Ohio. This company will do both a wholesale and retail business. It solicits catalogues from manufacturers of all kinds of electrical material and supplies.

The Minneapolis Electric Equipment Co., 227 South 5th street, Minneapolis, Minn., which has been conducting a general electrical supply and contracting business for a number of years, has sold its supply and jobbing department to a new incorporation known as The Peerless Electrical Co. The new company will do a strictly jobbing business under the management of Harry W. Nebelthan, at the old address. The Minneapolis Electric Equipment Co. will conduct a contracting business under the management of Mr. Zahm, at 510 Third avenue, South, Minneapolis, Minn.

A. J. Cole, who for the past four years has been district manager of the Westinghouse Lamp Co., Chicago, has resigned his position, effective as of March 1, and has taken a substantial interest in The McGraw Co., operating electrical and mill supply jobbing houses at Sioux City and Omaha. He will become its vice-president and general sales manager.

The Acker Electrical Co., of Sheboygan, Wis., is located in its new store, with large display rooms and booths for displaying fixtures, portable lamps, heating appliances. The entire building—608 Eighth street, with a front of 60 feet, and two stories and basement—is devoted exclusively to the display of electrical goods. This company has just completed the 16-mile high tension line from Green Bay to Brilion, Wisconsin. This line will distribute current to small towns in that district.

PERSONAL

Charles E. Poyer has been appointed assistant general sales manager of the Edison Storage Battery Co. Mr. Poyer has been with the Edison interests for about four years, having served first on the personal engineering staff of Mr. Edison in the development of special application of the alkaline battery, and later as assistant advertising manager. For the past two years he has been manager of the house lighting department.

F. J. McCormack, formerly assistant sales manager of the H. T. Paiste Co., has been made sales manager of the Illuminating Electric Mfg. Co., of Philadelphia, Pa.

Duncan A. McKenzie has been appointed manager of the Union Electric Co., Hamilton avenue and Clark street, Trenton, N. J., as successor to W. I. Peacock, who is no longer associated with that company.

W. R. Pinckard, Chicago manager of the Detail & Supply Department of the Westinghouse Elec. & Mfg. Co., has been elected president of the Chicago Electric Club.

J. E. Aldred has resigned as president of the Consolidated Gas, Electric Light & Power Co., Baltimore, Md., but remains as chairman of the board of directors. H. A. Wagner succeeds Mr. Aldred as president.

L. O. Duclos, for fifteen years sales manager of the Massachusetts Chemical Co., will shortly go into business for himself with headquarters in Boston. He will market various kinds of insulating varnishes and friction tape.

OBITUARY

H. Ward Leonard, founder of the Ward Leonard Electric Co., at Bronxville, N. Y., died suddenly while attending the mid-winter convention dinner of the American Institute of Electrical Engineers at the Hotel Astor on Thursday evening, February 18. Death was caused by apoplexy. Mr. Leonard was one of the early members of the Institute; he was elected as an Associate in July, 1887, three years after the Institute was founded. He became a Fellow in April, 1913. He was one of the comparatively few Life Members. His name has been a household word in the electrical industry for nearly 40 years. He possessed a great deal of inventive ability, and many patents for electrical devices were granted him, both in America and abroad, these inventions taking concrete form in the many types of circuit breakers, rheostats, automobile lighting and starting systems, and units and rods, now being manufactured by the Ward Leonard Electric Co. Mr. Leonard was one of the first men to advocate and apply the use of electrical energy for starting and lighting gasoline automobiles. He was also active in electric traction work. One of the early forms of self-contained electric locomotives was designed and made in his shop. His inventive genius was also turned to the practical application of electrical energy for operating elevators, mine hoists, and turning turrets on modern battleships. At the time of his death Mr. Leonard was consulting engineer for the company that bears his name.

Robert S. Ross, vice-president of the Varley Duplex Magnet Co., of Jersey City, died suddenly while at luncheon in the Holland House, New York, on February 6. Mr. Ross was well known in banking circles. At the time of his death he was vice-president of the Commercial Trust Co. of Jersey City.

Julius C. Sterns, president of the Sterns Electric Co., and one of Buffalo's pioneer dealers in electrical equipment and supplies, died Jan. 31 of blood poisoning. He was a member of the board of directors of the New York State Electrical Contractors' Association and of the National Electrical Contractors' Association.

ASSOCIATIONS AND SOCIETIES

M. R. Pevear read a paper entitled "Three Color Illumination" at a meeting of the New England section of the Illuminating Engineering Society, at Boston, on February 5.

The 1915 Yearbook of the American Institute of Electrical Engineers shows a total membership in that society on January 1, 1915, of 7,747.

It is rumored that J. J. Carty, chief engineer of the American Telephone & Telegraph Co., is the only candidate so far proposed as incoming president of the American Institute of Electrical Engineers. The election for officers of the Institute will take place in a couple of months.

At a meeting of the New York Jovian Luncheon Club on February 17, T. C. Martin, secretary of the National Electric Light Association, gave an illustrated address on "Electricity at the Panama-Pacific Exposition."

On February 19, F. C. Caldwell, professor of electrical engineering at the Ohio State University, lectured before the Pittsburgh Section of the Illuminating Engineering Society on "Effects on the Eye of Various Colored Illuminants."

At a meeting of the New York Electrical Society, 29 West 39th street, New York, on February 17, Putnam A. Bates, electrical engineer of the New York Fire Department, lectured on the new fire alarm system of New York.

A rousing Jovian Rejuvenation will be held at the Hotel Martinque, New York, on March 3, 1915, at 7 p. m. Those in charge promise refreshments and entertainment of an unusual quality.

The Illuminating Engineering Society will hold its next annual convention at Washington, D. C., during the third or fourth week of September, 1915. At a meeting of the council of this society held on February 11, twenty-four applicants were elected to membership. The New Haven Gas Light Co. and the George Cutter Co., of South Bend, Ind., were elected as sustaining members.

The Jovian Electrical League at Philadelphia celebrated the 68th birthday of Thomas A. Edison on February 11 by having a noonday talk by Albert E. Moise on "Factors of Success." Later in the afternoon there was a reception and entertainment at the Little Theatre, which was followed by a supper and dance in the ball room. This celebration was undertaken to show how much the Philadelphia League appreciates the inventive genius of the man who has made opportunities in life so plentiful for electrical men.

There has recently been formed at Saskatoon, Sask., by the engineering staffs at the power house, pumping plant, and street railway, what will be known as "The Utilities Engineering Society of Saskatoon." The objects of the society are the discussion of topics of interest to the engineers, operators, etc., employed at these various plants, with a view to increasing the efficiency of each. The society is the outgrowth of a series of monthly meetings of the heads of the various subdepartments under the jurisdiction of the city electrical engineer, which have been held during the past two years. At these meetings it was the custom to make a short review of the month's working, when ample opportunity was given for discussion, after which a paper was read by one of the members. These meetings proved so successful that it was decided to enlarge their scope, with the result that the above society has been formed. All members of the electrical, steam, and mechanical engineering staffs of the public utilities of the city are eligible for membership, provided the applicant receives the requisite number of votes. In addition to the papers contributed by the members, the executive hope to secure the assistance of visiting engineers, from time to time, by inviting them to speak at the meetings, on subjects relative to the various branches of engineering in which the members are interested. The officers of the society are: president, E. C. Hanson; vice-president, J. R. Cowley; treasurer, F. S. Woodcock; secretary, T. G. McIntosh. It is the intention to hold the meetings on the first Wednesday of every month.

ELECTRICAL DEVELOPMENT SOCIETY

A 20-page pamphlet recently issued by this society and entitled "What It Has Done," has been sent to members of the society in order to acquaint them with the various activities which have been carried on since the society was organized. It includes details of the work assigned to the respective publicity divisions; it tells what these divisions have done to induce prospective customers of electrical apparatus to "do it electrically," how they have gone about it, and the results accomplished. The pamphlet features the plan for a national electric week in the United States and Canada some time this autumn. "Everyone will profit by such a week," says the pamphlet, "the manufacturers and jobbers will sell more goods, the contractors will wire more houses and stores, the dealers will meet the demands for 'little electric servants', and the central stations will make a profit on the sale of energy. The result will be that cities, homes, factories, and stores will be better lighted—a benefit to them, and the great public will be further enlightened regarding things electrical, including power applications of all kinds."

At a meeting of the Board of Directors of the society held in New York, February 17, the matter of employing a resident representative on the Pacific Coast was discussed and referred to the president and general manager with power to act.

James Smieton, Jr., who has been acting as secretary-treasurer for the past year was appointed secretary-treasurer of the society.

The principal matter under discussion was the plan for a national electrical week. The board unanimously approved the plans of the committee, and it was decided to go ahead with the plans for an electrical week. The date for holding it was not definitely decided upon, but the majority of those present were in favor of holding it early in the Spring of 1916, as it was felt that this would give the manufacturers of all kinds of electrical devices a better opportunity to reap a substantial benefit. The matter was referred to a committee to be appointed by the president.

The general manager's and treasurer's reports showed the society to be in a satisfactory financial condition, that a very small percentage of the membership have resigned while a large number of members have already paid their subscriptions for the first half of 1915, and new members are continually joining. The society has a comfortable surplus left over from last year, thus giving assurance of no lag in activities during the coming year.

Acting on suggestions made by The Society for Electrical Development, many electrical display windows were attractively decorated during the three festal days last month—Lincoln's birthday, St. Valentine's day, and Washington's birthday.

FOREIGN TRADE OPPORTUNITIES

The Bureau of Foreign and Domestic Commerce maintains branch offices in eight commercial centers, where business men may more readily avail themselves of the service of the Bureau. Reserved addresses in connection with "Foreign trade opportunities" and all lists of names offered in connection with articles published in Commerce Reports may be obtained from the nearest office by application in letter form. The list of offices follow: New York, 409 United States Customhouse; Chicago, 629 Federal Building; New Orleans, 1020 Hibernia Bank Building; San Francisco, 410 United States Customhouse; Atlanta, 52 Post Office Building; Seattle, 922 Alaska Building; Boston, 752 Oliver Building; St. Louis, 402 Third National Bank Building.

The daily issued by the Bureau of Foreign and Domestic Commerce and heretofore called *Daily Consular and Trade Reports*, will hereafter be called *Commerce Reports.*

No. 15649. Electric and Photographic Supplies, Ect.—A business man in Russia requests an American consul to put him in communication with American firms with a view to purchasing electric and photographic supplies, also cut glass and porcelain. Correspondence should be in the Russian or French language.

No. 15650. Electrical Supplies, and Machinery of all Kinds.—A Russian merchant in the Far East has informed an American consular officer that he desires to receive catalogues, price lists, export discounts, etc., and wishes to be informed as to the probable time of delivery of electrical supplies, and machinery of all kinds.

No. 15654. Electic Light Fixtures, Etc.—A firm in Denmark has requested an American consular officer to put it in touch with American firms which are in a position to supply electric light fixtures and fixtures suitable for gas and acetylene lighting. Correspondence may be in English.

No. 15571. Electric Mountain Railway.—An American consular officer in Norway reports that a firm in his district is inviting bids for the construction of an electric mountain railway. It is stated that plans and specifications are being forwarded. When these plans and specifications arrive they may be examined at the Bureau of Foreign and Domestic Commerce and its branch offices. It is explained that an American firm recently secured a contract for the installation of a new automatic telephone exchange for an important city in that district. The consular officer states that he is in a position to supply the names of capable local representatives in the event successful bidders require such services. Correspondence may be in English.

No. 15475. Gas Engines, Pumps, and Electric Motors, Etc.—A commercial traveler, with engineering experience, has informed an American consular officer that he desires to obtain an exclusive agency for the sale of American goods in Spain. He is interested in gas, gasoline, kerosene, and crude-oil engines; pumps and pumping machinery; electric motors; and miscellaneous machinery tools and accessories. He will travel at his own expense, and proposes to assume all responsibility for the accounts of his customers. He desires to make payment of one-third cash against shipping documents, one-third on receipt and examination of the goods, and the balance upon installation of the machinery, etc.

No. 15582. Motors, Etc.—A firm in Europe has informed an American consular officer that it wishes to import electrical goods, especially electrical motors for driving machinery, etc. Correspondence and catalogues, etc., should be in Spanish.

Hardware, Electrical Fixtures, Etc., No. 15561.—An important firm in Russia has informed an American consul that it wishes to represent American manufacturers of hardware, tools, electric lamps, and electrical fixtures, etc. American references are given.

Vulcanized Fiber, No. 15562.—An American consular officer in Denmark reports the name and address of a business man in his district who wishes to correspond with exporters of vulcanized fiber. Correspondence may be in English.

Composition Wire, No. 15563.—A company in England has informed an American consul that it wishes to purchase composition wire similar to the sample which may be seen at the Bureau of Foreign and Domestic Commerce or its branch offices. The composition of the wire is 85 per cent. lead, 10 per cent. tin, and 5 per cent. antimony. The wire should be placed on reels. The firm proposes to purchase in ton lots.

Locomotive, Electrical Machinery, Etc., No. 15459.—An American consular officer in the Far East reports that a merchant in his district desires to receive catalogues, price lists, etc., on locomotives, dynamos, and electric lamps. He is in the market for a locomotive of from 40 to 60 h.p.; a dynamo, three-wire system, direct current; and lamps of 14 and 220 volts.

Telephone Supplies, No 15455.—A firm in Europe has informed an American consul that it wishes to negotiate for the purchase of paper insulated telephone cables, galvanized-iron wire, and porcelain insulators for telephone lines.

No. 15627. Tools and Magnetos.—A manufacturers' agent in Australia has informed an American consular officer that he wishes to get into communication with American firms handling or manufacturing tools and magnetos. It is stated that the agent wishes to submit bids for Government business. American reference is given.

No. 15662. Electrical and Hydraulic Power Machinery, Etc.—A business man in the United States has written the Bureau of Foreign and Domestic Commerce that a friend in the Near East wishes to get in touch with manufacturers of electrical and hydraulic power plants, flour-milling machinery, gasoline boats, and gasoline engines. It is stated that it is desired to utilize waterfalls for the purpose of creating energy for a power and light plant.

No. 15473. Electrical Machinery, Fixtures, and Supplies.—An American consular officer in Italy reports that a firm in his district desires to communicate with American manufacturers of electrical machinery, fixtures, and supplies. Correspondence should, if possible, be in Italian.

PUBLIC SERVICE NOTES

Gross earnings of the Southern California Edison Company for 1914 were $4,756,631, an increase of $27,368, while net earnings were $2,455,258, a gain of $124,160 over 1913. After interest charges of $892,010 and allowing $700,000 for depreciation the surplus for the year applicable to dividends was $930,966, compared with $835,020 in 1913. The balance available for common stock dividends after disbursements on the preferred stock was equal to 6.64 per cent.

The California Railroad Commission has issued an order authorizing the Pacific Gas & Electric Co. to issue $4,000,000 of 5 per cent. one-year gold notes to be dated December 15, 1914, and to be used in refunding $4,000,000 of its 5 per cent. one-year gold notes dated March 25, 1914. The company was also given authority to pledge $5,000,000 of convertible general lien bonds and $5,000,000 of general and refunding mortgage bonds as collateral security for the notes. The order provides that the notes shall be sold at not less than 98, and that the $5,000,000 of convertible general lien bonds, which will be pledged as collateral security, shall only be used for the purpose specified and shall thereafter be returned to the company's treasury and cancelled.

The Bucyrus Light and Power Co. has been authorized by the Ohio Public Utilities Commission to issue $58,000 of its 5 per cent. bonds, the proceeds to be used on additions and betterments to the company's property in Bucyrus. The company plans to purchase a new steam plant to replace the gasoline engine now in use. The new plant will have modern generators and will cose $41,000. The remaining $17,000 will be used for general improvement work.

The Boston Elevated Railway was recently awarded the Anthony N. Brady memorial gold medal for having made the best record in 1914 in conserving the safety and health of the public and its railway employees. This medal is awarded annually to the railway company having the best record in this respect. A silver replica of this medal was awarded to R. A. Sears, vice-president of this railway company, as a member in the operating staff whose efforts helped the railway company to win the gold medal. Another replica, in bronze, was awarded to H. V. Neal, a mechanic in the railway company's shops. As a result of Mr. Neal's efforts a safety system was adopted in the machine shops that reduced accidents last year by about 20 per cent.

The second of a series of booklets entitled "Short Stories of Public Utilities" has been issued by Williams, Dunbar, & Coleman, 60 Wall street, New York. This booklet contains in detail the composition and financial status of several of the large public utilities.

Max Thelen, president of the State Railroad Commission of California, has prepared and taken to Sacramento for presentation to the legislature a bill making effective the constitutional amendment adopted by the people of California last November giving the Railroad Commisison power to regulate public utilities operating within cities. Immediately following the passage of this bill by the Legislature the State Railroad Commission will be invested with the power of making and fixing rates for all public utilities operating within the state of California.

PUBLIC UTILITY RULINGS

CALIFORNIA

A light and power company entered into a contract to serve a manufacturing company with electric energy for power purposes at a price upon which the latter based a number of contracts upon which it entered. Such rates were materially increased when the Commission, at the request of the power company, established rates for power service. The power company now requested that it be permitted to charge the manufacturing company the contract rate formerly in effect. This application was granted, provided that when such contract expires, the power company shall charge the consumer, if it shall still desire energy, the rates then in effect for that class of service.—Half Moon Bay Light & Power Co.'s Application.

Value, as that term is used in rate fixing inquiries, is entirely foreign to value as a commercial term, the latter being based entirely on the returns and the former found for the purpose of establishing a return. Value for rate-fixing purposes can not be fixed by rules of general application, and no one condition can be controlling in determining the fair amount on which an earning shall be allowed.—Town of Antioch v. Pacific Gas & Electric Co.

A rate legally established for a specific service of electrical current is applicable merely to such service and not to specific individuals, and can not be modified or changed simply because of change of ownership or possession of the property receiving such service.—W. F. Morris' Application.

Electric service consists not only of the possession of the necessary facilities, but is an accomplished fact only when these facilities are used in connection with the actual delivery of electric energy to any person who may apply for the service. The procurement of a franchise from a county board of supervisors to construct and maintain electric power lines over and along the public roads of the county prior to the effective date of the Public Utilities Act would not authorize the grantee to construct his lines in any portion of the county including the territory served by another public utility; and the erection of a number of poles and the stringing of wires thereon which were neither connected with a source of supply nor with prospective consumers could not be considered as serving such territory under the Public Utilities Act. Mt. Konocti Light & Power Co. v. Gunn.

A brick company alleged that the defendant electric company had refused to extend its lines to render service desired by the complainant and petitioned the commission to compel the extension. It appeared that the cost of the extension would approximate $850 and that it would be unfair to expect the defendant company to incur such an expense with no protection for such invested capital. Two alternatives were outlined, providing service for the complainant and the necessary protection for the defendant, under either of which the defendant was directed to construct the necessary extension and to supply service at its regular rates. The first alternative was that the complainant should advance the $850 to the defendant at 6 per cent. per annum interest, to be refunded three years from the date when service commenced, provided all bills for service had been paid, and the service had not been discontinued. If service should be discontinued before the expiration of the three year period, the defendant should repay only a sum equal to the difference between the total of all sums paid, plus all sums then owing and unpaid for service, and what the complainant's total payments would have been at a uniform rate of 1½ cents per kilowatt hour, provided that the maximum sum so refunded should not exceed $850. The other alternative was that the complainant should guarantee the defendant against loss in the sum of $850 for the three year period under similar conditions. Colony Holding Corp. v. Coalinga Water & Electric Co.

Though the Commission has the power to alter contracts when in its judgment such alteration is necessary, it has no desire to interfere with contracts entered into with a full knowledge of their provisions by the contracting parties. In cases, however, where such contracts are unjust or exorbitant to the consumer or so low as to be unduly burdensome to the other customers of a utility, who must of necessity pay a rate out of proportion to their just share to equalize the difference in the utility's income, such adjustments as may be deemed proper must be made.—Half Moon Bay's Application for Increase of Rates for Service to Stone Company.

MASSACHUSETTS

It is true that courts have decided rate cases in which little or no evidence was offered save with respect to the values of the properties involved based upon their reproductive costs. But they have not yet said that this is the only test, or even that the trial court or the public board, whose action is questioned, must reach and state a definite finding as to value. Other elements have been expressly enumerated as "matters of consideration . . . to be given such weight as may be just and right in each case." A price is to be held confiscatory, if at all, because it may fairly be expected in its effect upon future business to operate to deprive the company of the reasonable earning power of its property. It is illogical to capitalize earning power as a test of value when the basis of earning power, the rate or price, is itself in question. But it is equally fallacious to assert broadly that cost of reproduction is the sole controlling test of earning power, especially when the price yields all that the capital employed under the restrictions and limitations, which have been described, has ever required. Northampton Gas Petition.

WISCONSIN

Application was made by the city of Manitowoc for authority to put into effect a minimum of $1 per month per horsepower of motors, regardless of continuity of actual use, actual horsepower to be determined as provided in the published schedule of the Manitowoc electric utility, or, in lieu of such rate, such other rate as the Commission should deem just. It appeared that there are a considerable number of power consumers in Manitowoc and that their motors were installed with the understanding that the minimum rate would be $1, regardless of the connected load. It was held that, under the circumstances, the minimum charge should increase with increases in the size of the connected load, but should carry with it a limiting rate to prevent extraordinary increases in power bills. The city was accordingly authorized to make a charge for electric power service of not less than $1 per month, and also to charge $1 per month for each horsepower in excess of one, provided that, except for consumption billed under the $1 minimum, the maximum rate should be 10 cents per kw.-hr.—In re Application of City of Manitowoc as Electric and Water Utility.

In a complaint that the rates of a public service company were unreasonable it was held that the rules of electric service formulated by the Commission do not make periodic inspections of all installations compulsory, for the reason that some consumers object to the inspection of their installations as an unnecessary interference, but the rules are designed to secure lamp inspection service for such consumers as desire it. It was also held that inasmuch as comparisons of the company's operating expenses and its investment with those of other utilities similarly situated did not place the company's business in an unfavorable light, sufficient ground was not established for a more costly investigation of the management and operation; and that a reduction of rates was not warranted.—Jones v. Berlin Public Service Co.

INQUIRIES

Inquiries which we have been unable to answer have been received for the names and addresses of manufacturers of the articles listed below.

Replies from our readers to any or all of these are cordially welcomed both for publication here, and for incorporation as well in our Classified Index of Manufacturers.

In the interests of the good services which this department is expected to render, we would impress upon correspondents the advisability of making their inquiries as specific as possible. This will help materially in obtaining the desired information.

"ABC" National auto horn.
"New Easy" gas burner.
"'Eddy" telephone receiver cord.
"Peerless" expansion bolt.
"Gates" cutout.
"Red-y" wire solder.
"Franklin" arc lamp.
"Vita" electric cooking apparatus.
"No Kair" electric stove.
"Zwicke" insulated wire.
"Bohler" magneto.
"Parmot" moulding.
"Climax" flat iron.
"Severn" gasoline engine.
Address of Try Fireless Cooker Co.
"Eureka" porcelain knob.
"Radio" electric hair waver.
"Rex" two light reflector.
"Utility" lantern.
"Rohne" electric heating pad.
"Emco" gauge tester.
"Learn-A-Code" (probably a self-instructor of telegraphy).
"Bedell" sad iron.
"Tugan" resistance wire.
"Acme" reflector tungsten lamp.
Address of Waldo Mfg. Co.

NEW CATALOGUES

Harrison Safety Boiler Works, Philadelphia, Pa.
Booklet. Cochrane Multiport Valves, 72 pages.

Terry Steam Turbine Co., Hartford, Conn.
Bulletin. Centrifugal pumps, 64 pages.

Crown Electrical Mfg. Co., Ltd., Brantford, Canada.
Catalogue. Lighting fixtures, 72 pages.

Pittsburgh Transformer Co., Pittsburgh, Pa.
Bulletin No. 1880. Experiences with line transformers, 16 pages.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Leaflet No. 3767. Magnet switch starters for a.c. motors with squirrel-cage and slip ring rotors.

Edward Schroeder Lamp Works, New York.
Booklet. Lighting fixtures and fittings, 10 pages.

Protective Signal Mfg. Co., Denver, Colorado.
Catalogue No. 1-C. Protective signal systems and signal devices, 52 pages.

Evolution Phone Co., Inc., New York.
Bulletin No. 1. Auristophone therapy, 8 pages.
Bulletin No. 2. Theraphone hand receiver earcap, 4 pages.

Wheeler Reflector Co., Boston, Mass.
Bulletin R. Para-steel reflectors, 16 pages.
Bulletin F. Multiple mazda fixtures, 4 pages.

General Electric Co., Schenectady, N. Y.
Bulletin No. 3,333. Multiple mercury arc rectifiers, 12 pages.
Bulletin No. 44,004. Railway line materials for direct suspension, 100 pages.
Bulletin No. 49,901. Oil testing set, 2 pages.

American Vulcanized Fibre Co., Wilmington, Del.
Bulletin No. 52. Vul-Cot junior waste baskets, 4 pages.

Phelps Mfg. Co., Detroit, Mich.
Bulletin No. 16. Motorless flashers, 8 pages.

DeVeau Telephone Mfg. Co., Brooklyn, N. Y.
Catalogue No. 24. Telephone apparatus and electrical specialties, 64 pages.

Bryant Electric Co., Bridgeport, Conn.
Booklet. Silent call signal systems for hospitals, 32 pages.
Booklet. Electrical wiring specifications for residences and apartment house, 32 pages.
Poster. Uno shadeholder.

Luminous Unit Co., St. Louis, Mo.
Booklet. Brascolite diffusion plus reflection, 12 pages.

Pennsylvania Specialty Co., Chicago, Ill.
Booklet. Won Kote modern architectural finishes, 24 pages.

Multi-Lux Illuminating Co., Cleveland, Ohio.
Booklet. Holders, reflectors, and fixtures, 32 pages.

Racine Electric Co., Racine, Wis.
Booklet. Electric vibrator, 16 pages.

Adams Bros. Mfg. Co., Pittsburgh, Pa.
Booklet. Cheerful gas and electric heating stoves, 30 pages.

Air Moistener Co., Chicago, Ill.
Booklet. Steamo air moistener, 8 pages.

Dale Lighting Fixture Co., New York, N. Y.
Booklet. Lighting fixtures installed in Equitable Building, 8 pages.

Interstate Electric Co., New Orleans, La.
Price List No. 9 TM. Duncan portable watthour meters.

Rome Wire Co., Rome, N. Y.
Folder. Copper history as told in prices.

Lincoln Electric Works, Chicago, Ill.
Folder. Cooking and heating devices.

Meadows Mfg. Co., Pontiac, Ill.
Folder. Safety power washer.

Delta Electric Co., Marion, Ind.
Folder. Electrical specialties.

Haag Bros. Co., Peoria, Ill.
Folder. Ideal bench washer.

Hart & Hegeman Mfg. Co., Hartford, Conn.
Mailing Cards. Paiste pipe taplets, covers, and fittings.

Century Electric Co., St. Louis, Mo.
Folder. Single phase motors.

Utility Compressor Co., Detroit, Mich.
Folder. Garage compressors.

M. W. Dunton Co., Providence, R. I.
Wall Hanger. Soldering Kinks No. 4.

P. R. Mfg. Co., Detroit, Mich.
Folders. P R bells.

G & W Electric Specialty Co., Chicago, Ill.
Mailing Card. Pot heads.

Robbins & Myers Co., Springfield, Ohio.
Folder. New Type K polyphase induction motors.

Trumbull Electric Mfg. Co., Plainville, Conn.
Folder. Insulating joints and hickeys.

Diehl Mfg. Co., Elizabeth, N. J.
Mailing Card. Dealer sales helps.
Folder. Type G motors.

CONSULTING ENGINEERS

Anthony J. Bemis has opened an office as consulting engineer in electric railway and lighting work at 39 South LaSalle street, Chicago.

E. P. Burch, consulting electrical engineer, of Minneapolis, Minn., has associated himself with Lester M. Sears for general consulting engineering practice. The new firm have opened offices on the twenty-third floor of the Dime Savings Bank building, Detroit, Mich.

Ford W. Harris, of Los Angeles, has given up his practice as a consulting engineer to enter the firm of Townsend, Graham & Harris, specializing in patent and trade-mark litigation. The new firm intends to make a specialty of electrical and mechanical cases. Frank L. A. Graham and F. M. Townsend, the other members of the firm, have been in business as patent attorneys in Los Angeles, for some years.

E. P. Roberts has opened an office as a consulting engineer at 2053 East 96th street, Cleveland, Ohio.

Eugene W. Stern, consulting engineer of New York and secretary of the American Institute of Consulting Engineers, has been appointed chief engineer of the Bureau of Highways, Borough of Manhattan, New York.

United States Patent No. 1,126,788 awarded on February 2, 1915, to Lawrence F. Kries, Baltimore, Md., is for a combined switch and fuse box adapted to permit access to the fuses only after the current to the fuses has been cut off. It is adapted to prevent at all times access by other than authorized persons to the live terminals of a switch.

JOVIAN LEAGUES

For the information of Jovians who visit any of the following cities we give below the time and place at which each of the several Luncheon Clubs meet:

Akron—Monday, 11:30 a. m., Black Whale Inn.

Baltimore—Thursday, 12:30 p. m., Emerson Hotel.

Bluefield—Last Saturday of month, 7:30 p. m., Altamont Hotel.

Boise—Every other Thursday, 12 m., Commercial Club or Owyhee hotel.

Buffalo—Saturday, 12:30 p. m., Lafayette Hotel.

Calgary—Twice a month, 12:15 p. m., Cronn's Rathskeller.

Charlotte—First and third Saturday of month, 1 p. m., Gem Cafe.

Chattanooga—Thursday, 12:30 p. m., Read House.

Chicago—Monday, 12:15 p. m., Hotel Sherman.

Cincinnati—Every other Monday, 12:30 p. m., Gibson Hotel.

Cleveland—Thursday, 12 m., club rooms, Hollenden Hotel.

Columbus—Every other Thursday, 6 p. m., and 12 m., alternately different hotels.

Dallas—Monday, 12 m., Oriental Hotel.

Dayton—First and third Monday of month, 12 m., Dayton Club.

Des Moines—Sat. 12:30 p. m., Kirkwood and Randolph, alternately.

Detroit—First and third Saturday of month, 12:30 p. m., Board of Commerce.

Duluth—Second and fourth Tuesday, 12:15 p. m., St. Louis Hotel.

Erie—First and third Monday of each month, 6:30 p. m., Reed House.

Fort Wayne—15th of each month, hour selected, Wayne Hotel.

Fort Worth—Tuesday, 12:15 p. m., at different cafes.

Galveston—Third Monday of each month, Harmony Hall.

Grand Rapids—First Sat. of month, 12:15 p. m., Association of Commerce.

Hartford—Thursday, 12:30 p. m., Bond's Cafe.

Houston—First and third Thursday of month, 6:30 p. m., Bender Hotel.

Huntington—Last Friday, each month, Frederick Hotel.

Indianapolis—Monday, 12:15 p. m., Hotel Severin.

Knoxville—First Tuesday of month, 12 m., Imperial Hotel.

La Crosse—Second and last Monday of month, 12 m., La Crosse Club.

Lethbridge—First Monday of month, 8 p. m., offices of Municipal Railway.

Lexington—First Tuesday after tenth of month, place to be selected.

Los Angeles—Wednesday, 12 m., Christopher's, No. 551 S. Broadway.

Louisville—Every other Monday, 12:30 p. m., different hotels and cafes.

Milwaukee—Every other Tuesday, 12:15 p. m., Hotel Blatz.

Minneapolis—Every other Tuesday, 12 m., breakfast room, Rogers Hotel.

Nashville—First and third Saturday of month, 12:30 p. m., Hermitage Hotel.

New Castle—Every Wednesday, 12 m., Y. M. C. A.

New Orleans—Second and Fourth Tuesday, 12:05 p. m., Hotel De Soto.

New York—Every other Wednesday, 12:30 p. m., Hotel Martinique.

Norfolk—Fourth Friday of month, 8 p. m., Lorraine and Lynnhaven.

Oklahoma City—Friday, 12 m., Skirvin Hotel.

Peoria—First and third Saturday of month, 1 p. m., Jefferson Hotel.

Philadelphia—Thursday, 12:30 p. m., Hotel Adelphia.

Pittsburgh—Thursday, 12:15 p. m., Fort Pitt Hotel.

Pittsfield—First Saturday of each month, 6:30 p. m., Wendell Hotel. Informal lunch every Wednesday, 12:15 p. m., G. E. Co.'s restaurant, Kellogg st.

Portland—Thursday, 12:15 p. m., Hazelwood Restaurant.

Richmond—Fourth Tuesday each month, 1 p. m., Business Men's Club.

Rochester—Thursday, 12:15 p. m., Chamber of Commerce.

Sacramento—Saturday, 12:15 p. m., Peerless Cafe.

St. Louis—Tuesday, 12:30 p. m., American Annex, Market street.

St. Paul—First and third Thursday, 12:10 p. m., Emporium Tea Room.

Salt Lake—Thursday, 12:30 p. m., Commercial Club.

San Antonio—Wednesday, 12 m., at St. Anthony Hotel, and on second Thursday of each month at 6:45 p. m., at different cafes.

San Francisco—Tuesday, 12:15 p. m., Hof Brau Cafe.

Schenectady—Third Wednesday of month, 12:15 p. m., Glenn's Restaurant.

Seattle—Friday, 12:30 p. m., Hotel Lincoln.

Sioux City—Thursday, 12 m., different hotels.

Spokane—Fourth Tuesday of month, 12 m., East Room, Davenport's.

Springfield, Ohio—Last Friday of month, 12 m., Commercial Club.

Syracuse—Saturday, 12:15 p. m., Empire Hotel.

Tacoma, Wash.—Tuesday, 12 m., Grill Room, Hotel Olympus.

Toledo—Saturday, 12 m., Kaiserhof.

Toronto—Friday, 1 p. m., Prince George Hotel.

Twin Falls—Third Thursday, 7 p. m., Room 5, Power Building.

Waco—Thursdays, 12 m., Riggins Hotel.

Warren—Second and fourth Friday, 6:30 p. m., at different places.

Washington, D. C.—Wednesday, 12:30 p. m., Commercial Club.

Winnipeg—Second Wednesday of month, 12:15 p. m., St. Regis Hotel.

NEWLY APPROVED FITTINGS

Cabinets

Type "E" equipment, consisting of a sheet-steel cabinet enclosing a two-wire cartridge fuse cutout base with meter testing clips. Rating 30 a., 250 v. When used at service entrances a fused service switch must also be used. Made by Metropolitan Engineering Co., 1250 Atlantic avenue, Brooklyn N. Y.

Conduit Boxes, Fittings

Supports of galvanized sheet steel for securing receptacles and rosettes in 3¼-in. outlet boxes not provided with threaded lugs for attaching covers or receptacles. Standard only for use where receptacle or rosette can be drawn tight against wall or ceiling or edges of outlet box. Made by Pass & Seymour, Inc., Solvay, N. Y.

Cutout Bases, Cartridge Fuse

Type "E" equipment, consisting of a two-wire cartridge fuse cutout base with meter testing clips, enclosed in a sheet-steel cabinet. Rating 30 a., 250 v. When used at service entrances a fused service switch must be used. May by Metropolitan Engineering Co., 1250 Atlantic avenue, Brooklyn, N. Y.

Fastener

"Bull-Dog" fastener consisting of a square, galvanized, sheet-steel washer having internal edges formed to engage with surface of tubing. For securing ¼ in. flexible tubing in switch and outlet boxes. Made by Christo Mfg. Co., Richmond, Va.

Fixtures

Fixtures shown by examinations conducted by Underwriters' Laboratories to be in accordance with requirements of National Board of Fire Underwriters. Made by Cohen & Co., 9-17 E. Broad street, Richmond, Va.

Ground Clamps

"S G C" ground clamp for use with No. 10 B. & S. gauge ground wire. A single piece clamp of copper, provided with suitably spaced holes and with galvanized bolt, nut and washer for clamping to rigid conduit. Adjustable for use with conduit up to 1 inch in size. One end of clamp is tinned and channeled to form equivalent of a lug for soldering to ground wire. Made by Star Electric Co., 422 S. Fourth street, Philadelphia, Pa.

Insulating Materials

Colored vitrified porcelain, having non-absorptive, non-combustible and insulating qualities, rendering it suitable for use in low-voltage electrical appliances, where ordinary white porcelain has been accepted as standard. Made by Woodbridge Pottery Co., Woodbridge, N. J.

Lamp Guards

"Appleton" vaporproof lamp guards. These devices consist of "Unilet" conduit boxes, each fitted with a glass globe and metal guard Type G, 660 w., 250 v. Made by Appleton Electric Co., 212 N. Jefferson street, Chicago, Ill.

Receptacles, Standard

Sign receptacle, 660 w., 250 v. Made by Bryant Electric Co., Bridgeport, Conn.

Steel Boxes

Pressed steel boxes in single units for use with flexible tubing, or rigid conduit. These boxes have one removable side, and fastenings by which a gang box of any desired number of units can be obtained. Made by Federal Electric Co., P. O. Box 1406, Pittsburgh, Pa.

Switches, Rotary Flush

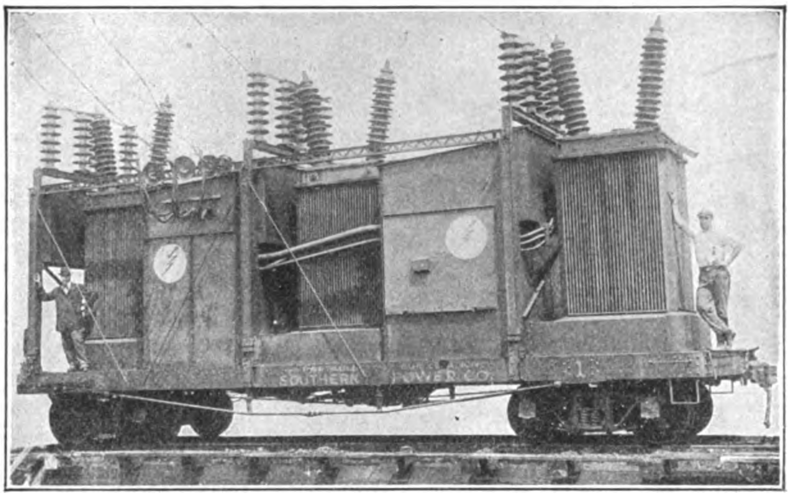
"Bryant" or "Perkins." Combination switch and pilot lamp. These devices each consist of a "Perkins" flush switch and pilot lamp mounted on a porcelain base and provided with a single face plate. 10 a., 125 v. Made by Bryant Electric Co., Bridgeport, Conn.

Wires, Miscellaneous

Flexible cable having slow-burning insulation, for use with picture machines. Marker, two brown threads woven parallel in inner braid. Made by Chicago Insulated Wire & Mfg. Co., Sycamore, Ill.

A 100,000-Volt Portable Substation

One of the most interesting papers read at the midwinter meeting of the American Institute of Electrical Engineers held in New York last month was that describing the construction and operation of a 100,000-volt portable substation now in use by the Southern Power Co. This substation, put in service late last year, has an actual capacity of 4000 kva., and will operate at a maximum pressure of 100,000 volts. After giving in detail the purpose and design of this substation, the authors go on to say that in order to allow transport through tunnels and under bridges, it is necessary to house the transformer terminals, and to lower the lower tension switches. In the case of the transformer terminals, this is accomplished by rigging from the latticed strut structure, forming the top of the frame work above the car, a wooden derrick, the parts of which are carried as car equipment. With this derrick the terminals are lowered through openings in the tops of the cabs, where special steel racks are provided for these terminals, including sheet steel cylinders, which cover the ends of the terminals normally under oil, and prevent the entry of moisture to the condenser type bushings.



100,000-volt portable substation in operation on 44,000-volt circuit. Southern Power Co.

No less than 42 different high tension pressures can be obtained from the secondary side. These pressures range from 13,200 to 100,000 volts, the steps increasing at an average rate of about 2100 volts. The current-carrying capacity of the windings is such that 20 out of these 42 possible high-tension arrangements can be used with rated capacity output from the transformer (1000 kva.) without exceeding, in continuous operation, a temperature rise of 40 deg. cent. Low-tension windings provide for full capacity output at 2200, 4400, 6600, and 13,200 volts. Therefore, out of the 168 possible ratios of transformation 112 of these combinations can be secured with full capacity of the transformer.

The station was first put into commission at Kings Mountain, N. C., and was run there from July 12 until July 26, 1914, connected to the 44,000-volt transmission system, stepping down to 2200 volts, carrying an average load of 2200 kw., consisting of cotton mills and the city municipal lighting and power requirements. At this particular point the permanent substation had become outgrown and it became necessary to rewire and enlarge it. Instead of putting in temporary work, the portable substation was located on an adjacent railway siding and tapped to the main transmission line on the primary side. The various feeders from the permanent station were connected to an outside bus which was in turn connected to the low-tension terminals of the portable substation, thus cutting out the main substation entirely. This work was all done with practically no interruption of service to the city or the manufacturing interests, and permitted the work of rebuilding the permanent station to be done economically and expeditiously.

On the night of July 30 two of the three 44,000-volt transformers permanently installed in the substation at Hickory, N. C., failed during a lightning storm. The portable substation was immediately forwarded to this point and picked up the entire load of the permanent substation at 3:30 a. m. August 4, and remained in operation until August 27, carrying an average load of 1000 kw., consisting not only of cotton mill requirements, but also of municipal light and power requirements of the city. The permanent substation at this point is located about two miles from the nearest railroad siding. A 2300-volt circuit extended from the permanent station to the mill which was adjacent to this railroad siding. In order to pick up the total load of the permanent substation the top of the 2300-volt line was rebuilt so as to accommodate three 44,000-volt conductors, and the 44,000-volt line was extended over this line to the railway siding. The portable substation was then connected to this 44,000-volt line, and the 2300-volt circuit was used to transmit current back to the permanent substation and from there distribute it over the regular lines; the 2300-volt line being of comparatively small size, it was necessary to operate at a somewhat increased voltage in order to compensate for the line drop, and in order to take care of the mill immediately adjacent to the portable station two bucking transformers were installed, by which means the voltage for this mill was cut to the proper value.

On August 27, 1914, the substation supplying one of the mills in the vicinity of Winston-Salem was badly damaged by fire and the portable substation was immediately shipped to that point, and the service was restored at 3:30 p. m. on August 30. The station remained in operation at this point from August 30 until October 18, carrying an average load of 300 kilowatts. During this run the blower was not used. The supply mains to the mill were 13,200 volts primary and 2200 volts secondary. The portable substation was used in transforming these voltages. The station is self-contained and all parts of the equipment are transported on the car when in transit.

The Schneider Electrical Works, 304 South 12th street, Omaha, Neb., has taken over the Jas. A. Cultra Electrical Works formerly located at Omaha.

Several of the large electrical contracting concerns at Duluth, Minn., report an unusually active season in the building industry, and a consequent increase in wiring and equipment jobs.

Langer & Rubenoff have opened a shop at 878 Ninth avenue, New York. They will do a general electrical contracting business and will also carry a few supplies.

RECENT ELECTRICAL PATENTS

Batteries

1,126,666. *Method of Charging Storage Batteries.* David H. Wilson, Meadville, Pa., assignor to Wilson Storage Battery Co., New York.

1,126,670. *Apparatus for Charging Storage Batteries.* David H. Wilson, Ridgewood, N. J., assignor to Wilson Storage Battery Co., New York.

1,125,970. *Primary Battery.* Henry Ssanyi, New York, N. Y., assignor to Maxivolt Primary Battery Co., New York.

1,126,669. *Apparatus for Charging Storage Batteries.* David H. Wilson, Ridgewood, N. J., assignor to Wilson Storage Battery Co., New York.

1,126,668. *Apparatus for Charging Storage Batteries.* David H. Wilson, Ridgewood, N. J., assignor to Wilson Storage Battery Co., New York.

1,126,671. *Storage Battery.* David H. Wilson, Ridgewood, N. J., assignor to Wilson Storage Battery Co., New York.

1,125,321. *Secondary or Storage Battery.* Carroll Hodge, Radnor, Pa.

1,126,295. *Primary Battery.* Auguste L. Saltzman, East Orange, N. J., assignor, by mesne assignments, to New Jersey Patent Co., West Orange, N. J.

1,125,080. *Storage-Battery-Charging Switch for Automobiles.* Ernst Eisemann, Stuttgart, Germany.

1,126,422. *Storage Battery.* Rudolphe Drambourg and Joseph E. Reid, New York.

Controlling and Regulating Devices

1,126,198. *Control System for Electric Motors.* Authur J. Hall, Wilkinsburg, Pa., assignor to Westinghouse Electric & Mfg. Co.

1,125,815. *Controller for Electric Motors.* Herbert W. Cheney, Milwaukee, Wis., assignor, by mesne assignments, to Allis-Chalmers Mfg. Co.

1,126,412. *Electric Control System for Railways.* Robert C. Dawson, Barnesboro, Pa.

1,124,809. *Circuit-Controlling Apparatus.* Frank W. Roller, East Orange, N. J., assignor to Roller-Smith Co., New York.

1,124,280. *Electric-Motor-Controlling Means.* John C. Brackett, Chicago, Ill.

1,126,163. *System of Electric-Motor Control.* William Cooper, Pittsburgh, Pa., assignor to Westinghouse Electric & Mfg. Co.

1,124,290. *Current-Controlling Device for Electric Circuits.* George A. Burnham, Saugus, Mass., assignor to S. B. Condit, Jr., Boston, Mass.

1,125,267. *Electric Regulation.* John L. Creveling, New York, N. Y., assignor to Safety Car Heating & Lighting Co.

1,126,043. *Circuit-Controller.* Arthur C. Livermore, Edgewood, Pa., assignor to The Union Switch & Signal Co., Swissvale, Pa.

1,125,717. *Electric Regulator.* Forrest E. Ricketts, Derwood, Md., assignor of one-half to Pierre O. Keilholtz, Baltimore, Md.

1,124,732. *Controller for Electric Motors.* Ford W. Harris, Wilkinsburg, Pa., assignor to Westinghouse Electric & Mfg. Co.

1,124,678. *Circuit-Controller.* Theodore Varney, Pittsburgh, Pa., assignor to Westinghouse Electric & Mfg. Co.

1,126,620. *Electric Regulation.* John L. Creveling, New York, N. Y., assignor to Safety Car Heating and Lighting Co.

1,126,434. *Controller for Electric Circuits.* Adolph F. Feller, Berkeley, Cal.

Electric Switches and Cutouts

1,127,379. *Electric Switch.*. Clarence A. Bates, Bridgeport, Conn., assignor to The Perkins Electric Switch Mfg. Co., Bridgeport, Conn.

1,126,494. *Electric Switch.* Maurice Levison, Chicago, Ill., assignor, by direct and mesne assignments, to Chicago Signal Co., Chicago, Ill.

1,126,788. *Electric Switch.* Lawrence F. Kries, Baltimore, Md.

1,127,375. *Electric Time-Switch.* John H. Robertson, Platteville, Wis.

1,126,951. *Electric Switch.* Pearl D. Bucknum, Oklahoma, Okla.

1,126,455. *Electric Snap-Switch.* Hans H. Hansen, Chicago, Ill.

Generators, Motors, and Converters

1,125,728. *Alternating-Current Synchronous Dynamo-Electric Machine.* Joseph Sachs, Hartford, Conn., assignor, by mesne assignments, to The Hart & Hegeman Mfg. Co., Hartford, Conn.

1,126,676. *Ignition-Dynamo.* Charles Thomas Mason, Sumter, S. C., assignor to Sumter Electrical Co., South Carolina.

1,125,783. *Electric Power Plant.* Harry F. Waters, Colorado Springs, Colo.

1,126,334. *High-Frequency Alternator.* Ernst F. W. Alexanderson, Schenectady, N. Y., assignor to General Electric Co.

1,126,061. *Dynamo-Electric Clutch.* William Morrison, Des Moines, Iowa.

1,125,039. *Electric Motor.* Walter J. Bauroth, Columbus, Ohio, assignor to The Jeffrey Mfg. Co., Columbus, Ohio.

1,125,349. *Magneto.* Oertel H. Lemke, Milwaukee, Wis.

1,126,363. *Alternating-Current Motor.* Donald M. Bliss, West Orange, N. J., assignor to Thomas A. Edison, West Orange, N. J.

1,127,158. *Dynamo-Electric Machine.* Vincent G. Apple, Dayton, Ohio, assignor to The Apple Electric Co., Dayton, Ohio.

1,124,630. *Dynamo-Electric Machine.* Hans Lippelt, New York.

1,125,913. *Electric Machine.* John B. Roche, Grand Rapids, Mich.

Heating Devices

1,127,373. *Electric Heater.* Robert H. Read, Schenectady, N. Y., assignor to General Electric Co.

1,127,374. *Electric Heater.* Robert H. Read, Washington, D. C., assignor to General Electric Co.

1,124,541. *Thermostat.* Harold D. Singer and Howard V. D. Pratt, Hospital, Ill.

1,124,303. *Electric Flat-Iron.* William H. Dalton, Salem, Mass.

1,125,059. *Sparkless Thermostat.* George P. Carroll, Bridgeport, Conn., and Frank N. Roehrich, Jersey City, N. J.

1,125,889. *Electrically-Heated Steering-Rim.* Reuben S. Smith, Kansas City, Mo.

1,124,849. *Electrically-Energized Heater.* Oscar B. Brush, Joliet, Ill.

1,126,935. *Electric Heater.* Chester M. Angell, Santa Barbara, Cal., assignor to The Van Briggle Tile & Pottery Co., Colorado Springs, Colo.

1,124,548. *Electric Heating Attachment for Radiators.* Theodore A. Steller, Houghton, Mich.

1,124,910. *Electrical Heater.* Elza D. Johnson and George A. Cathey, Klamath Falls, Oreg.

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ACETYLENE LIGHTERS.
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ADAPTERS, Auto Lamp.

For changing Gas or Oil Lamps to Electric.

GENERAL ELECTRIC CO., Schenectady, N. Y.
HUBBELL, INC., HARVEY, Bridgeport, Conn., "Dazlite."
MANHATTAN ELEC'L SUPPLY CO., 17 Park place, New York.
METAL SPECIALTIES MFG. CO., 738 W. Monroe st., Chicago, Ill. "Gil-Bo."
MORSE, FRANK W., Boston, Mass., "Electrofier."
PLUME & ATWOOD MFG. CO., Waterbury, Conn.
ROSEN & CO., A. W., 610 Broadway, New York, N. Y.

Black Mfg. Co., Fort Wayne, Ind.
Campbell Co., A. S., Boston, "Cello."
Castle Lamp Co., Amesbury, Mass.
Chicago Electric Mfg. Co., Chicago.
Cole & Co., Henry, Boston, Mass.
Gray & Davis, Cambridge, Mass.
Horn & Brannen Mfg. Co., Phila.
Standard Elec. Novelty Co., Chicago,

ADAPTERS, Lamp.

Tungsten Adapters.
Socket Adapters & Extensions.

BENJAMIN ELECTRIC MFG. CO., 120 So. Sangamon st., Chicago, Ill. (Tungsten Adapters).
BRYANT ELEC. CO., Bridgeport, Conn. (Candelabra).
FEDERAL SIGN SYSTEM (ELEC.), Lake & Desplaines sts., Chicago, Ill.
HUBBELL, INC., HARVEY, Bridgeport, Conn.
WHITE MFG. CO., J. H., 111 N. 3d st., Brooklyn, N. Y. (Tungsten).

Advance Mfg. Co., Pittsburgh, Pa.
Arrow Electric Co., Hartford, Conn.
Erikson Elec. Co., L., Boston, Mass. (Tungsten Adjustable Joint).
Phila. Elec'l & Mfg. Co., Phila., Pa.
Westinghouse Lamp Co., New York.

ADJUSTABLE FIXT. BRACKETS.
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ADJUSTERS, Cord & Lamp.

AMERICAN VULCANIZED FIBRE CO., 500 Equitable Bldg., Wilmington, Del., "Q. & C."
AUSTIN & CO., M. B., 700 Jackson blvd., Chicago, Ill., "Gem."
CONDIT ELECTRICAL MFG. CO., Boston, Mass., "Saca."
DIAMOND STATE FIBRE CO., Bridgeport, Pa.
McGILL MFG. CO., 39 Oak st., Valparaiso, Ind., "Innovate."
MATTHEWS & BRO., W. N., 3705 Forest Park blvd., St. Louis, Mo., "Easy."
MORSE, FRANK W., Boston, Mass. ("Handy" Cord and "Webster" Lamp Adjuster).
PHELPS MFG. CO., Detroit, Mich. ("Any Angle" Lamp Fixture).
TRUMBULL ELECTRIC MFG. CO., Plainville, Conn.
YOST ELEC. MFG. CO., Toledo, O. ("Electrogrip" Lamp Adjuster).

Advance Mfg. Co., Pittsburgh, Pa., "Heinz."
American Enamel Co., Providence.
Arrow Electric Co., Hartford, Conn., "Dow."
Bates, H. A., Garwood, N. J., "Slip-on."
Carter & Co., J. W., Abilene, Texas, "Eclipse."
Cohn, Adolph, West Hoboken, N. J., "Rela."
C. & D. Mfg. Co., Dayton, O.
Electric Specialty Mfg. Co., Pittsburgh, Pa., "King."
Estes & Sons, E. E., New York (Wood).
Gam Mfg. Co., Lancaster, Pa.
Gund Mfg. Co., La Crosse, Wis., "Two Ball."
Hagstrom Bros. Mfg. Co., Lindsborg, Kan. (Push Button).
Harter Specialty Co., Waukegan, Ill.
Johnny Co., Greenville, O.
Lorentz, Henry E., Baltimore, Md.
Milam & Son, B. C., Frankfort, Ky.
Novelty Turning Co., Norway, Me.
Reel Adjustable Fixture Co., Chicago.
Runzel-Lenz Electric Mfg. Co., Chicago, Ill. ("R-L" Telephone Switchboard Cord Length Adjuster).
Stewart Elec. Co., F. H., Phila., Pa.

ADJUSTERS, SOCKET CHAIN.
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ADJUSTERS, Switchplate.

Elec. Apparatus Co., Chicago, Ill.

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ALARMS, Tank.

OSTRANDER & CO., W. R., 22 Dey st., New York, N. Y., "Neu."
STANLEY & PATTERSON, 23 Murray st., New York, N. Y., "Patterson."
WALDMAN, JOHN J., 136 Liberty st., New York, N. Y.

Irish Electric Co., W. F., New York, "Shamrock."

ALUMINUM.

ALUMINUM CO. OF AMERICA, Pittsburgh, Pa.

Elec. Smelting & Aluminum Co., Lockport, N. Y.
So. Aluminum Co., Whitney, N. C.

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ANCHORS, Guy, also Rods.

CROUSE-HINDS CO., Syracuse, N. Y., "Harpoon," "Adjustarod."
ELECTRIC OPERATIONS CO., Bush Terminal, Brooklyn, N. Y.
LANZ & SONS, M., Pittsburgh, Pa.
MATTHEWS & BRO., W. N., 3705 Forest Park blvd., St. Louis, Mo.
OSHKOSH MFG. CO., Oshkosh, Wis.

Barbed Anchor Mfg. Co., Louisville.
Barnes & Kobert Mfg. Co., Milldale, Conn., "B. & K."
Benicia Iron Works, San Francisco.
Bluffton Anchor Co., Bluffton, O.
Chance Mfg. Co., Centralia, Mo., "Never Creep."
Everstick Anchor Co., St. Louis.
Falls Elec. Co., Lima, O., "Clum."
Gund Mfg. Co., La Crosse, Wis., "D. & T."
Hallett Iron Wks., Harvey, Ill., "Hiawatha."
Johns-Manville Co., H. W., New York, N. Y., "J-M."
Klein & Sons, Mathias, Chicago, Ill.
Line Material Co., So. Milwaukee, Wis. (Guy Rods).
Miller Anchor Co., Norwalk, O., "Safety."
New England Bolt & Supply Co., Everett, Mass. (Guy Ropes).
Oliver Iron & Steel Co., Pittsburgh, Pa. (Guy Rods).
Simpson Anchor Co., Niagara Falls.
Specialty Device Co., Cincinnati, O., "Bierce."
St. Louis Malleable Casting Co., St. Louis, Mo., "O. K."
Universal Cable Grip Co., Syracuse, N. Y., "Red Top."
Wapak Hollow Ware Co., Wapakoneta, O.

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ANNUNCIATORS, Limousine.

Cowels & Co., C., New Haven, Conn.
O'Brien Co., Joseph F., New York.

ANNUNCIATORS, Standard.

Elevator, Telephone, Hotel, Burglar Alarm.

ANSONIA ELECTRICAL CO., Ansonia, Conn.
CONNECTICUT TELEPHONE & ELECTRIC CO., Meriden, Conn.
DE VEAU TELEPHONE MFG. CO., 477 18th st., Brooklyn, N. Y., "Auth."
EDWARDS & CO., New York, "Dixie," "Etonial," "Semaphore."
HOLTZER-CABOT ELECTRIC CO., Boston, Mass.
MANHATTAN ELECTRICAL SUPPLY CO., 17 Park pl., New York.
MENOMINEE ELEC. MFG. CO., Menominee, Mich.
OSTRANDER & CO., W. R., 22 Dey st., New York.
PARTRICK & WILKINS CO., Philadelphia, Pa., "Competition."
STANLEY & PATTERSON, 23 Murray st., New York, N. Y., "Premier."

Hepburn Tele. Mfg. Co., Chicago (Illuminated).
Moon Mfg. Co., Chicago, Ill., "Knapp," "Eclipse," "Acme."
Samson Elec. Co., Canton, Mass., "Ross," "Rival," "Dandy," "Hub."

ANTI-HUMS.

BUNNELL & CO., J. H., 32 Park pl., New York.
MANHATTAN ELEC'L SUPPLY CO., 17 Park pl., New York.

Harvard Elec. Co., Chicago, Ill.

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ARMATURES.
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Ohio Cross Arms Co., Columbus, O.

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ARMS, CROSS, (Wood).

BARNES-LINDSLEY MFG. CO., Portland, Ore.
BERTHOLD & JENNINGS LUMBER CO., Wright Bldg., St. Louis, Mo.
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Swayne R. B., San Francisco, Cal.
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Texas Arm & Pin Co., Beaumont.
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ARMS, Mast.

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MORRIS, ELMER P., 136 Liberty st., New York.

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Fletcher Mfg. Co., Dayton, O.
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Phila. (Pa.) Elec'l Mfg. Co.
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ARRESTERS, Lightning.

Light and Power.

GENERAL ELECTRIC CO., Schenectady, N. Y.
WESTINGHOUSE ELEC. & MFG. CO., East Pittsburgh, Pa., "Wurtz."
WOOLLEY, W. DOUGLAS, 30 N. Michigan ave., Chicago, Ill., "C-C Non-Gap."

Arrow Conductor & Mfg. Co., Chicago.
Brach Supply Co., L. S., New York.
Delta-Star Elec. Co., Chicago, Ill.
Elec. Service Supplies Co., Phila.
Gifford El. Mfg. Co., Traverse City, Mich.
Lord Mfg. Co., Brooklyn, N. Y., "Shaw," "Multi-Vapo-Gap," "Abacot."
Oleson Spring Co., Toledo, O.

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CHICAGO FUSE MFG. CO., Chicago.
D. & W. FUSE CO., Providence, R. I.
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RELIABLE ELEC. CO., Chicago, Ill.

Am. Elec. Co., Chicago, Ill.
Automatic Fusible Lightning Arrester Co., Colorado Springs, Colo.
Brach Supply Co., L. S., New York.
Butler Elec. Co., Easton, Pa.
Chance Mfg. Co., Centralia, Mo., "Sky-Rocket."
Cook, F. B., Chicago, Ill.
Cox Arrester Co., C. E., Eaton, Ohio.
Cracraft, Leich Elec. Co., Genoa, Ill. (Self-Cleaning Shunt Arresters).
Ericsson Mfg. Co., Buffalo, N. Y.
Foote, Pierson & Co., New York, "Argus."
Garford Mfg. Co., Elyria, O.
Gifford Elec. Mfg. Co., Traverse City, Mich., "Paradox."
Harvard Elec. Co., Chicago, Ill.
Howard, A. G., Holdredge, Neb.
Insulator Arrester Co., Duluth, Minn.
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Minneapolis (Minn.) El. Co., "Chapman."
National Elec. Specialty Co., Toledo, O., "Vac-M."
P. & M. Co., Chicago, Ill.
Royal Elec. Co., Sidney, O., "Hypostat."
Schinn, W. C., Lincoln, Neb.
Stromberg-Carlson Tele. Mfg. Co., Rochester, N. Y.

ARTIFICIAL (PHANTOM) LOAD INSTRUMENTS. — See Instruments, Testing and Measuring.

ASBESTOS.

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Acme Asbestos Covering & Supply Co., Chicago.
Carey Mfg. Co., Phillip, Cincinnati.
Ehret Magnesia Mfg. Co., Phila.
Franklin Mfg. Co., Franklin, Pa.
General Asbestos & Rubber Co., Charleston, S. C.
Johns-Manville Co., H. W., N. Y.
Keasbey & Mattison Co., Ambler, Pa.
New Jersey Asbestos Co., Camden, N. J., "Gladiator."
N. Y. Asbestos Mfg. Co., New York.
Norristown Magnesia & Asbestos Co., Norristown, Pa.
Sall Mountain Asbestos Mfg. Co., Chicago.
Watson Co., H. F., Erie, Pa.

ASBESTOS, WIRE.
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ATTACHMENTS.

Gas Fixture.

BRYANT ELEC. CO., Bridgeport, Conn.
MANHATTAN ELEC'L SUPPLY CO., 17 Park pl., New York, N. Y.
PLUME & ATWOOD MFG. CO., Waterbury, Conn.
TRUMBULL ELEC. MFG. CO., Plainville, Conn.
WHITE MFG. CO., J. H., 111 N 3d st., Brooklyn, N. Y.

Am. Brass & Copper Co., New York
American Pin Co., Waterbury, Conn.
Spencer's Sons, I. S., Guilford, Conn.
Steele & Johnson Mfg. Co., Waterbury, Conn.
Walsh Mfg. Co., Owen, New York, N.Y.

ATTACHMENTS, Socket.

Socket Pulls.
Chain Adjusters.
Chain Extensions.

HUBBELL, INC., HARVEY, Bridgeport, Conn., "Ham," "Harding," "Economy."
PEERLESS LIGHT CO., Peerless Bldg., Chicago, Ill. ("Flexo" Socket Pull).
PHELPS MFG. CO., Detroit, Mich.
RITTENHOUSE CO., A. E., Honeoye Falls, N. Y., "Easylite."

Barry Mfg. Co., Boston, Mass.
Empire Engineering & Supply Co., New York.
Premier Novelty Co., Chicago, Ill. ("Just Pull" Socket Pull).

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AUTOMOBILES, Electric.

American Elec. Car Co., Saginaw, Mich., "Argo," "Broc," "Boland-Grannis."
Anderson Elec. Car Co., Detroit, Mich., "Detroit Electric."
Atlantic Vehicle Co., Newark, N. J
Atlas Car & Mfg. Co., Cleveland, O. (Trucks).
Automatic Transportation Co., Buffalo, N. Y. (Baggage Trucks).
Bailey & Co., Amesbury, Mass.
Baker Motor Vehicle Co., Cleveland.
Beaver Motor Truck Co., Portland, Ore.
Buffalo Elec. Vehicle Co., Buffalo.
Capitol Truck Co., Denver, Colo.
Century Elec. Car Co., Detroit, Mich.
Champion Wagon Co., Oswego, N. Y. (Commercial Vehicles).
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Chicago El. Motor Car Co., Chicago.
Cleveland Galion Motor Truck Co., Cleveland, O.
Columbian Elec. Vehicle Co., Detroit.
Columbus Buggy Co., Columbus, O.
Commercial Truck Co. of Am., Phila.
Couple-Gear Co., Grand Rapids, Mich. (Commercial Vehicles).
Cyco-Electric Car Co., New York.
Dayton Elec. Car Co., Dayton, O.
Dey Elec. Vehicle Syndicate, New York.
Elec. Vehicle Ass'n of America, N. Y.
Electriquette Mfg. Co., Los Angeles, Cal., "Osborn" Chair.
Empire El. Veh. Co., Oswego, N. Y.
Field Elec. Bus Co., New York.
Fritchie Auto & Bat. Co., Denver.
Galion (O.) Dynamic Motor Truck Co. (Trucks).

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All doubts and fears caused by the concentric wiring bugaboo have been dispelled for at least another year. The net result of the agitation of the last four months is not an economic upheaval in the industry, as predicted, but a simple formal request from the committee having this matter in charge to be allowed to dig deeper. A manufacturers' committee will also do some digging on its own hook. When all the digging is done, and the secrets of concentric and other wiring systems thoroughly exposed and compared, it will be in order for the industry at large to adopt, reject, or compromise as it sees fit. Meantime it is but commonplace to add that should any change occur the sagacious manufacturers will be quite ready for it.

On May first the present statutory maximum rate of 10 cents a kilowatt-hour for light and power in New York will be reduced to 8 cents. Under the 10-cent rate the power company used to furnish its patrons with free renewals of carbon lamps, one for one, of all wattages, also with free renewals of 60 and 100-watt mazda lamps, one for one. Under the new rate consumers have the choice of paying the company 8½ cents a kilowatt-hour for energy consumed, and getting free lamp renewals as formerly, or paying 8 cents a kilowatt-hour and buying lamps from the company at wholesale rates. Every consumer will, of course, now form himself into a committee of one to determine which plan is best for his pocketbook.

On top of the recent increase in the price of dry batteries comes notice of a further increase of 2 cents in the price of the No. 6 battery, 3½ cents in the price of the No. 7, and 5½ cents in thep rice of the No. 8. This increase is due to scarcity in the market of sheet zinc and manganese, two of the chief ingredients of all dry batteries. Despite these drawbacks there is unusual activity in the marketing of small lighting units utilizing dry batteries as a source of energy supply. These handy novelties have caught the public fancy, and a few cents one way or the other seems to have no effect on their production and sale. We show a new batch of them in the New Products section of this issue.

Elsewhere in this issue we refer to a few of the many modern uses for the induction coil, a device that holds first place for active service in various capacities over a long term of years. Developed by Faraday in the early days of the art, it has had a long, interesting, and useful life. More than any other single piece of electrical apparatus, it vitalizes many otherwise inert combinations of chemicals, metals, and the all-pervading ether. It furnishes the spark that drives the automobile, the motor boat, the flying machine, and the submarine. Without it there would be neither telephone nor wireless. Though unknown to most of the combatants in the war now raging in Europe, it is the one device that controls all operations on land, in the water, or in the air. If it could be withdrawn from service it would quickly curtail transportation, observation, and communication. Without an efficient spark coil the automobile, aeroplane, and submarine would be useless.

A reduction in the price of all sizes and types of mazda multiple lamps becomes effective the first of April. Like other reductions in cost this is as welcome as the flowers in spring, because it gives promise of still better things to come. Gas filled lamps are driving the older types hard, almost as hard as the mazda lamp drove the carbon several years ago. The decreased cost will undoubtedly result in a still more rapid replacement of vacuum lamps by the more efficient gas-filled units.

In step with the tidings of a reduction of 20 per cent. in the maximum rate for electric light and power in New York, the local telephone company has for the last year been deducting 10 per cent. from the face of all bills rendered under contract for local service. Another change, equivalent to a reduction in rates, will take effect on July first, when a flat rate charge of 5 cents a call will become effective between certain zones in Manhattan and the other Boroughs. Electric service appears to be the only oasis in the desert of economic pressure nowadays.

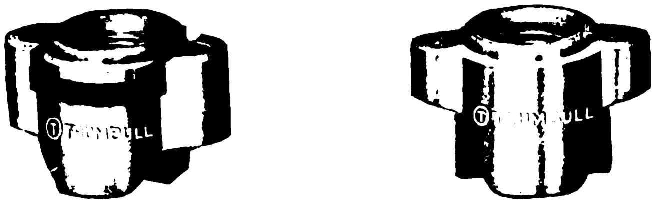
Once in a while we come across a textbook that is easy to read, but not often. Easy reading means hard writing, and hard writing involves bother, labor, and sweat. Textbook authors find it easier to compile with a shears and paste-pot—to pass on the other fellow's sayso—than to think it out, and then write from the point of view of the dummy in search of accurate elementary information. Like everybody else, the authors take too much for granted. Assuming the reader has acquired a clear understanding of the elements from some other source—though they never seem to direct the reader where to look for it—they move gaily onward on high gear, leaving the reader to wonder whether he is bereft or the author daft. There is too much of this sort of thing. What we need is an author or two like the one whose book on elementary electricity and magnetism is reviewed in this issue. This author has gumption, he has wit, and he has the sense to say that those who want to find out what electricity is had better turn to a work on etymology, the great science of words.

NEW PRODUCTS

THIS DEPARTMENT IS DEVOTED EXCLUSIVELY TO NEW GOODS, AND IS A COMPLETE MONTHLY RECORD OF PROGRESS

Trumbull Clamp and Two-Screw Sign Receptacles

Two new sign receptacles, called the clamp and two-screw types, respectively, have just been brought out by The Trumbull Electric Mfg. Co., of Plainville, Conn. The two-screw type is similar to the ordinary screw receptacle now on the market. The clamp type, on the contrary, is novel in several respects, the most novel feature being that it can be installed entirely from the rear of the board. The wireman does not have to work from the front at all. The distinguishing features of these receptacles are as follows:

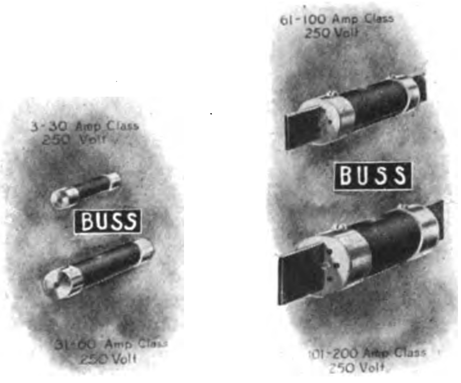


Clamp and two-screw type sign receptacles. The Trumbull Electric Mfg. Co., Plainville, Conn.

No screw holes are necessary, and the wireman saves work and time in mounting them. They are installed from the rear. The clamp is attached to the sign, and the screws are tightened. The wireman does not have to reach the front at all. Before tightening the screws the receptacles can be turned in any direction to line up with the wires. When the screws are tightened it is impossible to turn the receptacles; the sheet iron will bend or tear before the receptacle will budge. The clamp will take any thickness of sheet iron.

"Buss" Enclosed Fuses

A new line of enclosed fuses just approved by the Underwriters is made and marketed by the Bussmann Mfg. Co., 1121 Newhouse avenue, of St. Louis, Mo. This line is marketed under the trade name "Buss." As shown in the annexed illustrations these fuses consist of four classes; namely, 3-30 amperes, 250 volts; 31-60 amperes, 250 volts; 61-100 amperes, 250 volts; 101-200 amperes, 250 volts.



"Buss" enclosed fuses. Bussmann Mfg. Co., 1121 Newhouse avenue, St. Louis, Mo.

Franco Radio Nitrogen 3-volt Battery

Under this name the Interstate Electric Novelty Co., 29 Park place, New York, is offering the trade a 6-inch dry battery that is said to possess the lasting power of four ordinary dry cells. It can be used for either continuous or intermittent service, for general ignition or lighting purposes. It is of standard size.

Radio nitrogen battery. Interstate Electric Novelty Co., 29 Park place, New York.

Ostrander Electro-Mechanical Gong

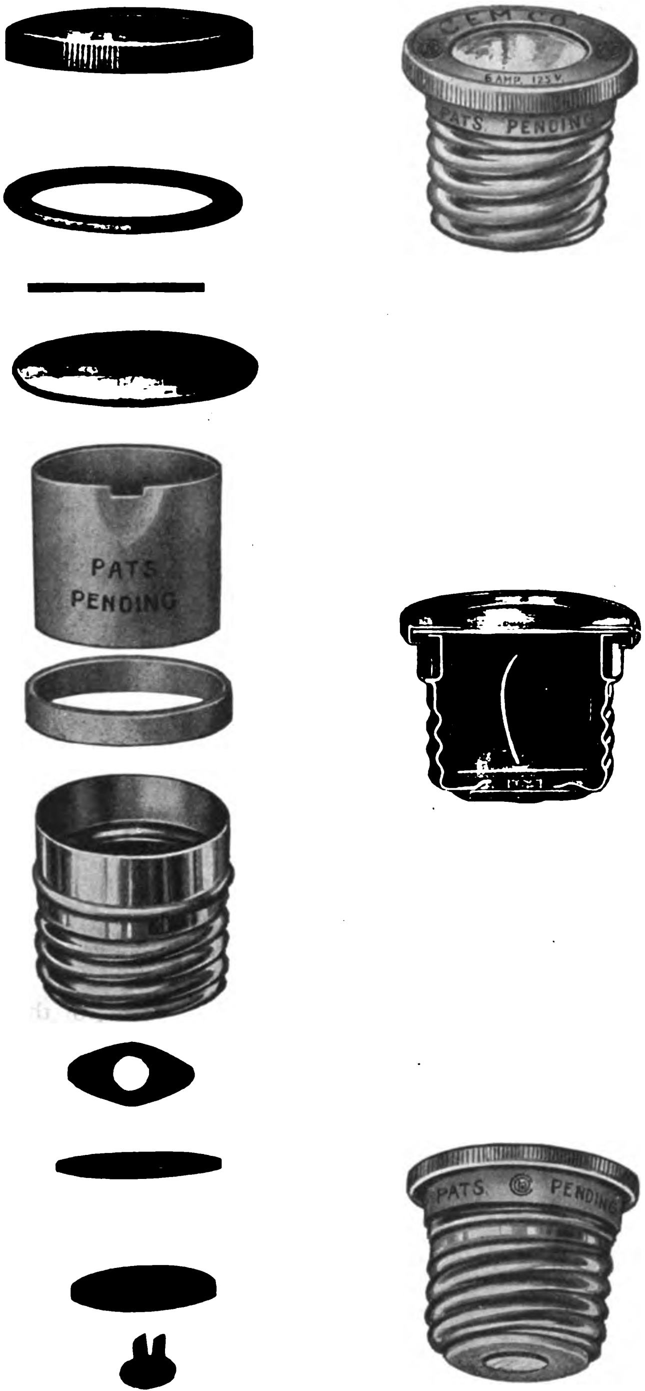
The accompanying cut shows a new form of electro-mechanical gong which has recently been brought out by W. Ostrander & Co., 22 Dey street, New York. After being wound up, the hammer will deliver 475 blows on the bell before rewinding is necessary. In this gong no hammer drop cam is used. A number of these gongs were recently installed in the new Equitable Building, Broadway, New York, two of the gongs being on each floor. They are in use there in connection with the service furnished by the American District Telegraph Co.

Electro-mechanical gong. W. R. Ostrander & Co., 22 Dey st., New York.

Connecticut Locatable Cap Socket and Fibre Fuse Plug

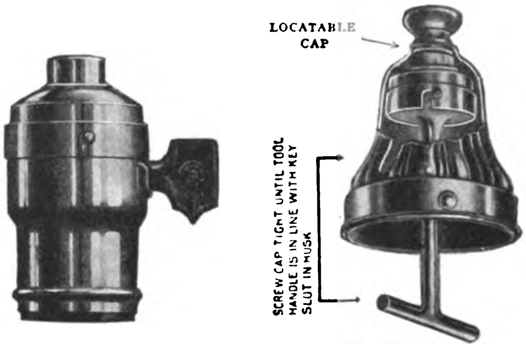
Two brand new electrical fittings possessing novel and long-sought features have just been put on the market by The Connecticut Electric Mfg. Co., Connecticut and Florence avenues, Bridgeport, Conn. The first is a locatable cap socket, the second a fuse plug built up of fibre, mica, and brass.

Unlike the older forms of fuse plugs, this one contains no porcelain at all. The absence of porcelain reduces its weight to less than half of that of the porcelain plug. It is so light in weight that it can be shipped in lots of 500 by parcel post. In size it is one-third smaller than the standard porcelain plug. It is composed of 11 pieces in all, 6 pieces of fibre, 3 of brass, 1 fuse, and a disc of mica—all as shown in the accompanying cut. It can be put together by anybody in half a minute. It has an air space 50 per cent. larger than that of the porcelain plug. This insures correct rating and blowing. Best of all, it is non-breakable. There is nothing fragile about it.



Component parts and finished product of built up fibre lined fuse plug. Connecticut Electric Mfg. Co., Bridgeport, Conn.

The socket is rated at 660 watts at 250 volts, and has its screw shell imbedded in porcelain. The make and break is quick in action, a pointed key indicating whether the current is on or off. No screws are used in attaching the cap to the shell, a novel and a useful feature. A pin and small boss located on the shell near the keyway snap into place when the cap is slipped over the shell and turned. When in place they prevent the cap from turning either way. The cap is slipped off by depressing the shell near the boss, and then turning the cap to the right to allow the pin to slip out of the L-shaped groove in the cap.

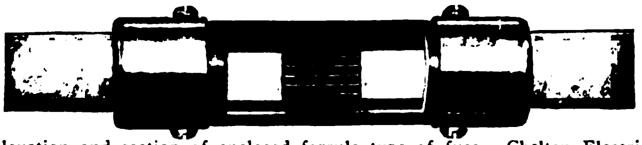

LOCATABLE CAP
SCREW CAP TIGHT UNTIL TOOL HANDLE IS IN LINE WITH KEY SLOT IN HUSK

Locatable cap socket. Connecticut Electric Mfg. Co., Bridgeport, Conn.

Another feature that will interest all dealers and contractors is the simple mechanical device of a narrow groove cut into the outside of the neck of the cap which screws on the nipple. The object of this groove is to allow the top to be turned through a wide angle even after it is firmly threaded on the nipple. The additional turning merely closes the mechanical groove. This additional turning allows the socket to be installed inside the husk so that the key will align perfectly with the keyhole in the husk. A key is furnished for this purpose. The directions say to screw the cap tight until the tool handle is in line with the key slot in the husk, then snap the bottom shell of the socket onto the top.

Chelten Enclosed Fuses

The Chelten Electric Co., 314 Armat street, Philadelphia, Pa., has recently marketed a new line of enclosed fuses. The fuse is of uniform rating, blowing in accordance with the Underwriters' requirements. At normal temperature it will carry indefinitely 10 per cent. greater load than rated capacity, and is calibrated to blow uniformly at 17½ per cent. overload; this percentage being a mean between the standard limits of 10 per cent. minimum and 25 per cent. maximum required by the Underwriters.

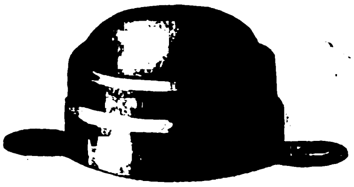


Elevation and section of enclosed ferrule type of fuse. Chelten Electric Co., 314 Armat street, Philadelphia, Pa.

These fuses are made in all standard sizes up to and including 600 amperes, in both the 250- and 600-volt types.

Universal Push Button

The Garford Mfg. Co., Elyria, Ohio, is offering the trade the new "Universal" push button shown herewith. The entire top is movable, insuring good contact regardless of the point at which pressure is brought to bear. The button shell is finished in black enamel, the top being made of a black composition. It is especially adapted for operating motor car electric horns.



Universal push button. The Garford Mfg. Co., Elyria, Ohio.

Return Call Buzzer Push Button

This contrivance is designed to meet the demand for a small return call signalling device for use in semi-public places like clubs, family hotels, and college dormitories. It is operated by a button on a button plate, or on a return call annunciator in the office. The buzzer is 3¼ inches wide and 4 inches high. It is made by the Holtzer-Cabot Electric Co., Brookline, Mass.

Return call buzzer. The Holtzer-Cabot Electric Co., Brookline, Mass.

Kennedy Allsteel Wireman's Grip

The wireman's grip shown in the accompanying cut has just been put on the market by the Kennedy Mfg. Co., 14 East Jackson boulevard, Chicago, Ill. This grip is a recent addition to the line of similar devices made by this company, some of which were described on page 33 of the Electrical Record for October, 1914. The grip illustrated is made in two sizes, one 19 inches and the other 21 inches long; both sizes are 8 inches wide and 9 inches high. A feature is the tray compartment, which is said to be the only thing of its kind furnished with tool grips. Beneath the tray there is ample space for a blow torch. This concern also makes a case 24½ inches long, 6 inches wide, and 9 inches high, with tray and space for blow torch. It is for bell hangers who carry 24-inch bits.

All steel wireman's grip. Kennedy Mfg. Co., 14 East Jackson boulevard, Chicago, Ill.

"Best" Composition Sign Receptacle

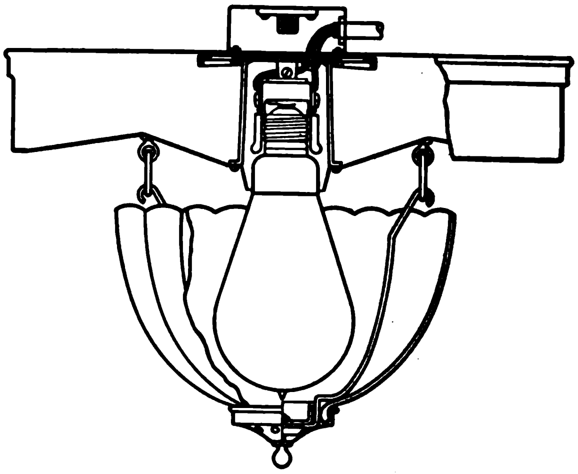
A new sign receptacle, made of a tough, durable asbestos composition, has been placed on the market by the Best Electric Co., of Pittsburgh, Pa. This receptacle is designed to withstand the rigors of outdoor service. The makers claim it is proof against both fire and water.

It is also claimed that this composition assures uniformity in size, so that the spacing is always the same. There is no variation in size, as with porcelain, and the receptacle cannot crack. Another feature is the fact that the nuts are moulded permanently into place so that they cannot work loose. Also, the interior screw shell is interchangeable, and is removed and renewable by simply turning back two screws.

Composition sign receptacle. Best Electric Co., Pittsburgh, Pa.

Adam Reflectolyte

In the accompanying illustration is shown a cross-sectional view of a semi-indirect lighting unit, recently developed by the Frank Adam Electric Co., 906 Pine street, St. Louis, Mo. The maker calls it a "Reflectolyte." It is equipped with a top reflector the surface of which



Section of Type P. F. Reflectolyte. Frank Adam Electric Co., 906 Pine street, St. Louis, Mo.

consists of two independent reflecting surfaces. These are disposed at a slight angle with relation to each other and also with relation to a horizontal plane. The surface of the outer portion of the reflector is arranged at such an angle that the rays are projected outwardly so as to produce the greatest volume of useful light on the working plane, the inner reflecting surface causes a large volume of the light reflected from the translucent shield to be projected downwardly through the glass without passing through the lamp bulb. The upper reflector is of heavy drawn steel, the surface being porcelain enameled.

A well ventilated cap fastens the translucent shade to the collapsible tripod holder. The cap supporting the translucent shade does not cast a shadow below the unit. The unit can be attached to the stud of any standard outlet box; should it be desired to attach unit to fixture stem or chain a knockout is provided, which can be readily removed.

This device is made in three sizes, 16, 20, and 24 inch. It is well adapted for use with nitrogen filled lamps.

Federal Safety First Lantern and Lamp

Another form of electric lantern is that recently put on the market by the Federal Sign System (Electric), Lake and Desplaines streets, Chicago, Ill. It is built of brass and steel and is nickel-plated throughout. The switch for turning the light on and off is attached to the bail. To turn on the light lower the bail as far as it will go on one side. This locks the switch on, and the bail snaps back into an upright position. To turn off the light, lower the bail as far as it will go on the opposite side. It carries a combination 4-cell, 6-volt dry battery. There are no wires; the connections are made when the battery is slipped into place.

Federal electric hand lamp. Federal Sign System (Electric), Lake and Desplaines streets, Chicago, Ill.

The electric lamp is 3 inches in diameter, 10 inches high, and weighs 3 lb. when equipped with a dry cell. It carries a miniature tungsten lamp rated at 5 candlepower.

Small General Electric Mazda Lamps with Concentrated Filaments

The concentrated filament mazda lamps of high wattages have proved so popular that the Edison Lamp Works of the General Electric Co., Harrison, N. J., has developed vacuum mazda lamps of similar appearance in the 25-, 40-, and 60-watt sizes. This concentrated filament construction gives greater vertical distribution of light than the regular mazda lamps of corresponding wattages. The new lamps will, therefore, be employed where natural distribution of light downward is required. They can be used in existing sockets and fixtures.

These lamps will be made in the same sized bulbs as the corresponding regular mazda lamps, will have the same spherical watts per candlepower efficiency, and will have a rated average life of 600 hours.

Flexo Handilight

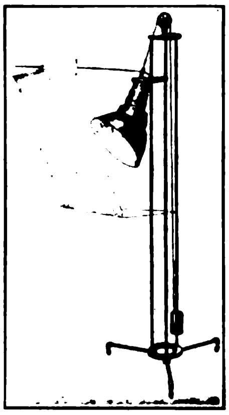
The Flexo Handilight is a combination of a Peerless attachment clip, cord and attachment plug, key socket and mazda lamp, and a Flexo shade. The shade is of brass, aluminum frosted inside to reflect light. Both shade and lamp are adjustable, and light can be reflected from any angle. It is made by the Peerless Light Co., Peerless Building, Chicago, Ill.

Flexo handilight. Peerless Light Co., Peerless Building, Chicago, Ill.

Photolite Lamp

The Photolite lamp is intended for those who need to have on tap a light for photographic purposes at any moment during the day or night. It is made by the National Lamp Works of General Electric Co., Nela Park, Cleveland, Ohio.

The unit comprises a 1000-watt mazda lamp having a bulb of special blue glass, a holophane angle steel reflector with holder, an iron stand, and supports for a diffusing screen.



Photolite lamp. National Lamp Works of General Electric Co., Nela Park, Cleveland, Ohio.

The feature in the Photolite lamp is its blue bulb, which reduces the luminous intensity of the light without affecting its actinic qualities. That is to say, the colored glass chosen absorbs the excess red, orange, and yellow rays in the light but allows free transmission of the blue-green, blue, violet, and ultra-violet rays. The result is a white appearing light of only one-third the luminous intensity but practically the same actinicity of the clear bulb 1000-watt mazda lamp. It is therefore possible to make high class exposures with a speed of average daylight by means of this lamp.

The complete unit is comparatively light and can be readily moved about. The lamp is easily adjusted to any height and angle. The manipulation of the Photolite requires no electrical knowledge. There are no carboning and cleaning troubles—no adjusting of mechanical parts.

"Kwik-Lite" Electric Lantern No. 1000

This new electric lantern uses a common round No. 6 battery and has been especially designed to meet the needs of those who wish a reliable, serviceable, low-priced device of this kind. It is made of pressed steel with black rubber finish. It has a convenient bail for carrying in the hand or it may be slipped over the arm, thus leaving both hands free. It is equipped with a special radio reflector, which is said to project a clear penetrating spot light fully 100 feet. This lantern is fitted with a mazda bulb, and convenient positive contact. It has no wire connections or adjustments of any kind. It is being marketed by the Usona Mfg. Co., Inc., at No. 1 Hudson street, New York, and 309 S. St. Clair street, Toledo, Ohio. This company has also secured exclusive rights to the battery lantern formerly known as the Beers Lantern.

"Kwik-Lite" electric lantern, No. 1000. Usona Mfg. Co., 1 Hudson street, New York, and 309 S. St. Clair street, Toledo, Ohio.

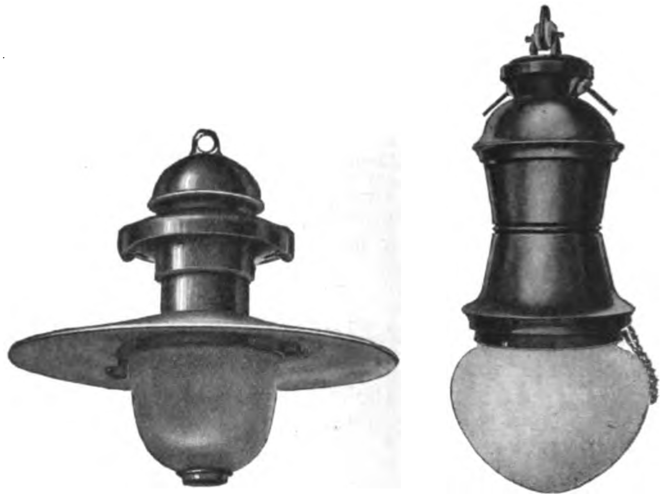
Adams-Bagnall Series Street Lighting Abolites

The introduction of the high candle power type "C" mazda lamps necessitates fixtures of an entirely new design to properly accommodate them. A line of such fixtures has just been brought out by the Adams-Bagnall Electric Co., Cleveland, Ohio. This line is composed of the combination and pendant Abolites shown in the annexed cuts.

Combination Abolites are made up of different combinations of standard parts. A standard high voltage porcelain insulator carrying a film cutout socket is used in combination with different reflectors and suspension castings. This is a desirable feature from the point of view of the user, because should it at any time become desirable to change the candle power of the lamp or method of suspension, this can be done by interchanging the parts, making a new combination suitable for the new size of lamp or method of suspension.

Combination Abolites are designed for straight series burning lamps. They can be furnished with reflectors only or with reflectors and double prismatic refractors.

Pendant abolites are designed especially for use with the new high efficiency lamps of 400, 600, and 1,000 candle power. For this service they are equipped with a compensator for taking current from a 6.6 or 7.5 ampere line and boosting the current to 15 or 20 amperes, as required by the lamp. Three compensators are made for use respectively with the 400, 600, and 1,000-c. p. lamps.

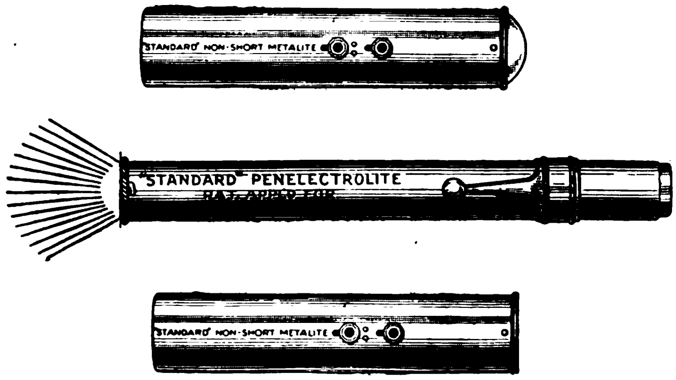


Combination and pendant abolites. The Adams-Bagnall Electric Co., Cleveland, Ohio.

The case is made of stamped copper or steel supported by a stamped copper or steel top. The top, with the compensator and the lamp socket, is suspended from a cast iron insulated hanger. The case and globe may be removed, leaving the top and working parts of the lamp suspended. The case is attached to the top by a bayonet joint which is locked in position by a spring. The globe is secured to the case by a bayonet joint, and attached by sufficient length of chain to allow of its hanging below the lamp bulb.

Standard Fountain Pen Flashlight

Another electric flashlight that bears a resemblance to a fountain pen has just been put on the market by the Standard Electric Novelty Co., 10-12, N. Des-


"STANDARD" NON-SHORT METALITE
"STANDARD" PENELECTROLITE
"STANDARD" NON-SHORT METALITE

Penelectrolite and metalites. Standard Electric Novelty Co., 10-12 North Desplaines street, Chicago, Ill.

plaines street, Chicago. It has the usual switch arrangement which prevents the battery from being short circuited. It is equipped with a cartridge shaped dry battery, and a miniature mazda lamp that is said to project the light rays for 100 feet.

Pathfinder Lantern

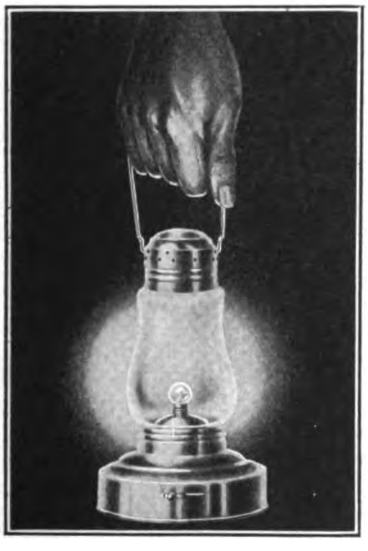
The large variety of electric hand lanterns now on the market has recently been added to by the two types of "Pathfinder" lanterns made by the Electrocraft Co., 2335 Callowhill street, Philadelphia, Pa.

Pathfinder lantern. Electrocraft Co., 2335 Callowhill street, Philadelphia, Pa.

Their two-cell lantern is shown in the accompanying cut. It measures 6¼ by 3¼ by 7 inches. The case is of steel with baked japan finish. It contains a 2.8-volt lamp consuming 0.3 ampere. A special lense makes it possible to read a newspaper 50 feet away.

Beacon Friar's Lantern

An electrical lantern with the same general outlines as the old fashioned oil lantern used by trainmen has recently been put on the market by the Beacon Miniature Electric Co., 118-120 Duane street, New York. The oil is replaced by an Aladdin dry battery guaranteed to give 5 hours' continuous and 10 hours' intermittent service, the wick is replaced by a mazda lamp of small candlepower, and the matches and wick by a small switch. This device is known to the trade as the "Friar's Lantern."

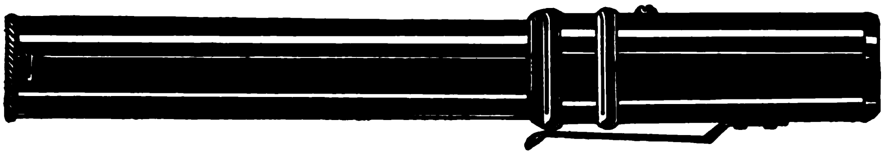


Friar's lantern, Beacon Miniature Electric Co., 118-120 Duane street, New York.

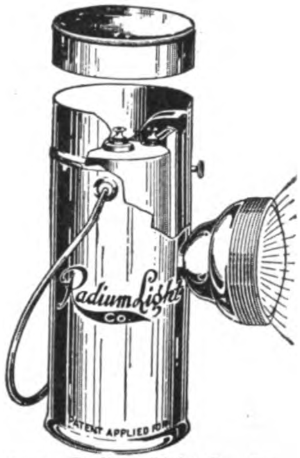
Radium Electric Lantern and Fountain Pen Flashlight

Among the many electric hand lanterns which have come into the market during the last few months is the one shown below and made by the Radium Light Co., Inc., 347 Fifth avenue, Pittsburgh, Pa. The special features of this lantern comprise: no loose attachments on the inside; no wires of any kind; a fine-coated white enamel reflector; a polished convex lens; and a No. 6 dry cell that will furnish lamp energy for an hour a day for 53 days. It is finished in enameled black japan.

Another novel lighting device now being marketed by this concern is the fountain pen flashlight shown in the illustration. It consists of a miniature mazda lamp, a cartridge shaped dry battery, a pocket clip, and a handsome nickle-plated holder. The light is turned on by pressing down on the nickle-plated cap that carries the lamp and the pocket clip. When the pressure is removed the cap slips back and turns the light off. This feature safeguards against accidentally connecting the lamp into continuous circuit, and thus depleting the battery.



Fountain pen flashlight. Radium Light Co., Inc., 347 Fifth avenue, Pittsburgh, Pa.



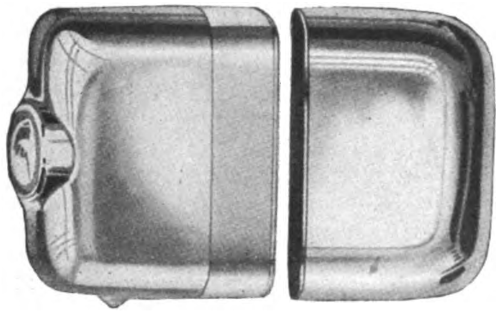
Radium electric lantern. Radium Light Co., Inc., 347 Fifth avenue, Pittsburgh, Pa.

Hansen Electric Lantern

This lantern, too, like the others appearing in this department, is operated by an ordinary dry battery. The lamp attachment can be removed from a dead battery and transferred to a live one at will. The lantern complete is made in two sizes: No. 1 will burn for 100 hours on intermittent service, No. 2 for 300 hours under the same conditions. The attachment is nickel-plated, and is equipped with a miniature mazda bulb, a switch for turning the light on and off, and clips for attaching to the battery. The maker is Marvin W. Hansen, 34 Eleventh street, Toledo, Ohio.

Kwik-Lite Telescope Flashlight

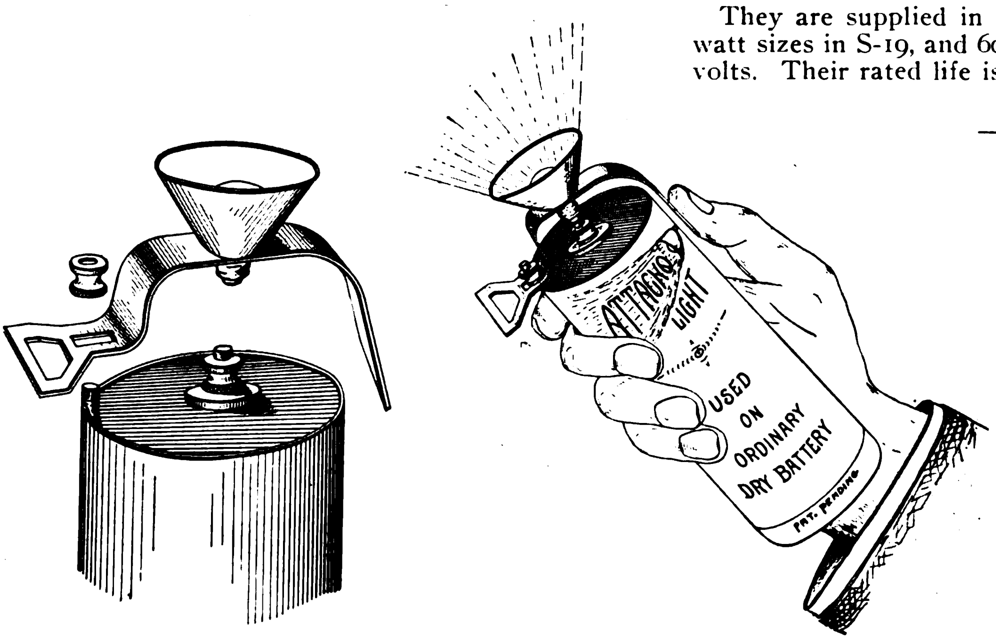
The newest thing in metal vest pocket flashlights is the Kwik-Lite telescope case shown below. It consists of two parts drawn into shape from a solid sheet of metal, the upper part telescoping into the lower. When pushed together, they firmly lock. With a slight pressure on the side of the case, the two pieces can be pulled apart, making it an easy matter to insert the battery. It has no hinges or clasps. It is supplied in a variety of finishes, including nickel, gun metal, statuary bronze, silver, and gold. It is now being marketed by The Usona Mfg. Co., Inc., 1 Hudson street, New York, and 309 South St. Clair street, Toledo, Ohio.



Kwik-Lite telescope flashlight case. The Usona Mfg. Co., 1 Hudson street, New York, and 309 S. St. Clair street, Toledo, Ohio.

Attacho Electric Lantern

Here is a simple little device that can be attached readily to any form of dry battery, preferably the No. 6 battery. It will give 100 hours of intermittent service, and an equally satisfactory amount of continuous service. It is made of spring brass finished in nickel. The current is turned on and off by turning the screw on the battery binding post forming the carbon terminal. One end of the attachment clip is secured to the zinc terminal as shown in the cut. The other end is pressed against the battery by the hand when the lantern is grasped. The light is automatically turned off when the pressure from the hand is released. This lantern is now being marketed by The Attacho Light and Novelty Co., 306 Frisco Bldg., St. Louis, Mo.



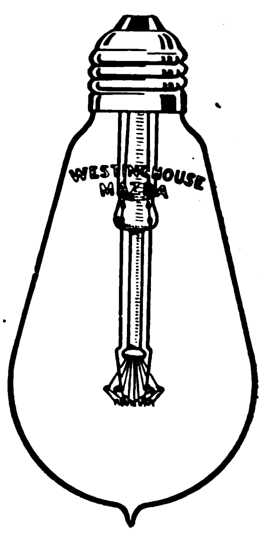
ATTACHO LIGHT
USED ON ORDINARY DRY BATTERY
PAT. PENDING

Attacho electric lantern. The Attacho Light and Novelty Co., 306 Frisco Bldg., St. Louis, Mo.

Westinghouse Concentrated Coiled Filament Lamps

The Westinghouse Lamp Co. have just standardized 25-, 40-, and 60-watt Westinghouse mazda lamps with a concentrated coiled filament construction similar to that used in the large gas filled mazda C lamps. The small lamps are, however, not gas filled but of the usual vacuum type.

The new filament construction greatly increases the downward or useful light of the lamps which makes them particularly desirable for service where natural distribution in the downward direction is required.



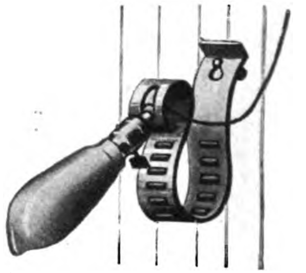
Mazda lamp with concentrated coiled filament. Westinghouse Lamp Co., 1261 Broadway, New York.

They are supplied in the usual bulbs, 25- and 40-watt sizes in S-19, and 60 watt in S-21, for 105 to 125 volts. Their rated life is 600 hours.

Bedpost Portable

The Pittsburgh Lamp, Brass and Glass Co., Pittsburgh, Pa., is offering the trade the new bedpost portable lamp shown in the annexed cut. This portable is finished in Old English brass, is equipped with 6 feet of cord and plug, and can be attached at any angle to either the side posts or top rail at the head of a bed.

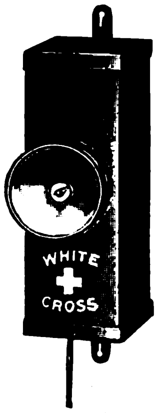
This reflector can easily be adjusted so as to concentrate the light at any point desired. As shown in the cut, the strap holding the lamp can be adjusted so as firmly to embrace any piece of furniture to which one may wish to attach it.



Bedpost portable. Pittsburgh Lamp, Brass & Glass Co., Pittsburgh, Pa.

White Cross Ceiling and Porch Lamp

A practical electric porch and ceiling lamp like the one represented in the cut has recently been put on the market by the Lindstrom, Smith Co., 1100 South Wabash avenue, Chicago, Ill. It can easily be attached to the ceiling of a porch, closet or pantry, or placed on the wall. It is provided with a long string connected to the switch, by means of which the light can be turned on and off. The lamp will burn continuously on one ordinary dry cell for about 40 hours, or, if used intermittently, from 6 to 12 months.

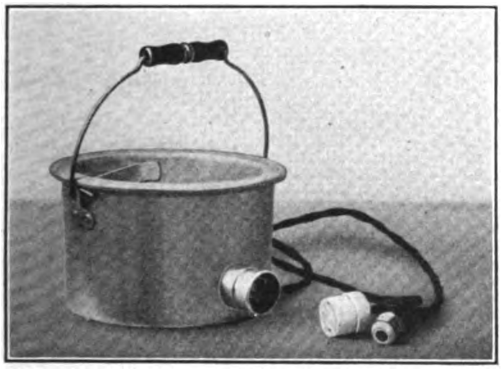


White Cross ceiling and porch lamp. Lindstrom, Smith Co., 1100 South Wabash avenue, Chicago, Ill.

It is provided with a tungsten bulb, a reflector and a lens. The switch is said to be so simple that it will not get out of order. The case is weather and fire proof. Battery can easily be installed by anyone in a few minutes.

Fearn Electric Glue Pot

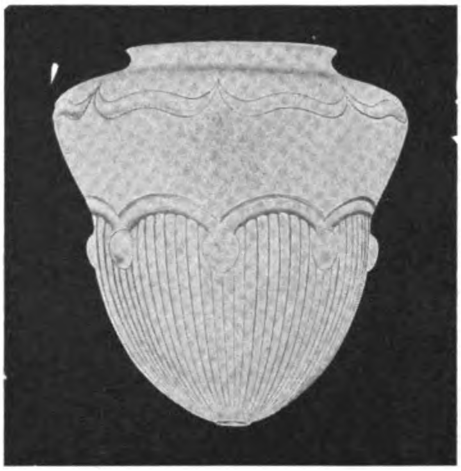
Among electrical heating devices manufactured by the Fearn Co., 206 N. Frederick street, Baltimore, is an electric glue pot, which is especially adapted for use where small quantities of glue or padding cement are required. Sheet aluminum is used in the construction of the pot. The three parts containing vessel, electrical heating element, and outer shell composing the pot are locked together rigidly at the top edge of the apparatus, leaving an air space between the parts, eliminating the use of a water jacket. This air space is utilized to distribute the heat evenly over the entire sides and bottom of the containing vessel. An even, steady heat that keeps the glue in excellent condition for any length of time is said to be obtained by attaching the pot to an ordinary electric-light socket. It operates on standard 110 volt service, working equally well on either alternating or direct current. Its energy consumption is trifling.



Fearn electric glue pot. Fearn Co., 206 North Frederick street, Baltimore, Md.

Consolidated Globes for Nitrogen Lamps

A new line of glassware, especially designed for use with nitrogen lamps, has been brought out by the Consolidated Lamp & Glass Co., of Coraopolis, Pa.



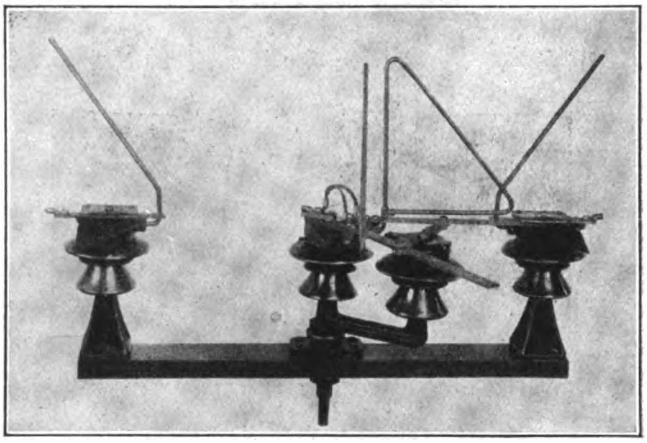
New globes for nitrogen lamps. Consolidated Lamp & Glass Co , Coraopolis, Pa.

This glassware is all made of the "Cora" white, for which the company claims the least absorption of light, the highest attainable lighting efficiency, and the obscuring of the filament.

This line is composed of 16 designs, made in 46 sizes.

Double-Throw Burke Horn Gap Switch

A single pole unit of the new double-throw horn gap switch made by the Railway and Industrial Engineering Co., Greensburg, Pa., is shown in the annexed cut. The main contacts of the switch are protected from all burning by auxiliary arcing horns. A feature of particular interest is the use of two blades placed at an angle of 60 degrees with each other. With the use of two blades mounted in this way it is necessary for the switch to rotate through less than 120 degrees of the circle, and it allows a simple crank and connecting bar type of operating mechanism to be used for interconnecting three such units for simultaneous operation.



Double-throw high voltage Burke horn gap switch. Railway and Industrial Engineering Co., Greensburg, Pa.

A three-pole switch of this type for 22,000-volt service can be carried on the top of a single wood pole.

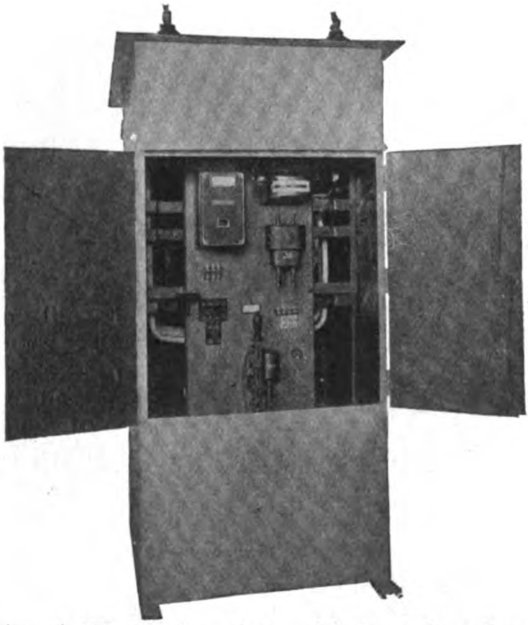
Anderson Small Capacity Time Switch

A time switch somewhat smaller than its old standard Type F switch has recently been developed by the Albert & J. M. Anderson Mfg. Co., 289 A street, Boston, Mass. It is made in four styles, as follows: 10-ampere, 250-volt, double throw, single throw; 10-ampere, 250-volt, three pole, single throw; 5-ampere, 600-volt, single pole, single throw; and 5-ampere, 250-volt, double pole, double throw for two rate meter service. All these switches are equipped with the improved indicating type of snap switch. The time piece is similar to that used in the other types of switches made by this company.

Small capacity time switch. Albert & J. M. Anderson Mfg. Co., 289 A street, Boston, Mass.

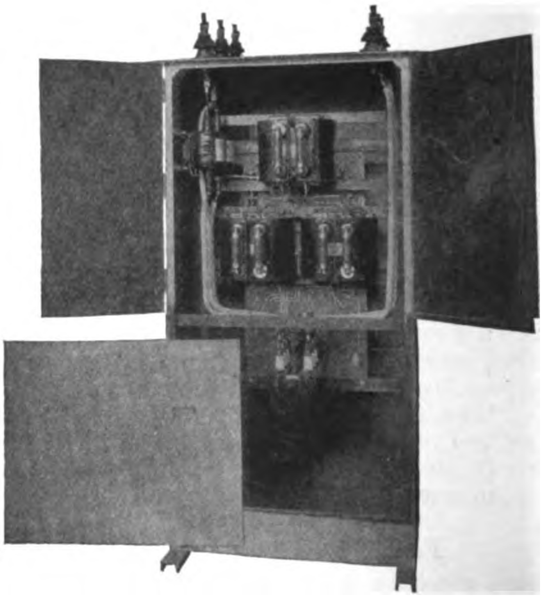
Rural Substation in Railway Signal Work

The accompanying illustrations show views of the first outdoor type steel switch houses built for railway signal purposes by the General Electric Co., Schenectady, N. Y. They are used in this connection by the Southern Railway at Inman, S. C., and Austell, Ga. These switch houses form part of the regular outdoor substation equipment now commonly used throughout the country.



Front view of 4400-volt, three phase, switch house for railway signal work. General Electric Co., Schenectady, N. Y.

The equipment of the switch houses is a little more elaborate than that usually required for power or lighting purposes. The ordinary house has merely an oil switch, or an oil switch and watthour meter, with the necessary current and potential transformers. In the house illustrated there are also an extra potential transformer, a voltmeter, a circuit closing relay, two potential receptacles, and an incandescent lamp with bracket. The extra transformer, two potential receptacles and voltmeter, in connection with the other two potential transformers required for the watthour meter, allow the voltage to be read on both sides of the oil switch before it is closed. The incandescent lamp gives illumination at night for reading the voltage or for lighting the inside of the house. The circuit closing relay is used in the usual manner to trip the oil switch in case of overload or short circuit.



Rear view of 4400-volt, three phase switch house for railway signal service. General Electric Co., Schenectady, N. Y.

Equipments of this kind are now being built by the General Electric Co. The houses are shipped wired complete, so that the only construction work necessary to put them in commission is to place oil in the oil vessels and connect the incoming and outgoing leads to the roof bushings.

Motion Picture Problem Solved

Where alternating current is used for projection work, it is practically impossible to secure a satisfactory picture because of the unsteadiness and noise of the arc and the low intensity of the light. This has been overcome, however, as is generally known by the use of a mercury rectifier that changes the alternating current into direct current which gives a clear, steady white light especially adapted for projection purposes.

The problem of making one reel blend into the other has been solved by the use of a four-pole double-throw switch, a Westinghouse type AL rectifier for moving picture work, and a compensator or economy coil such as is generally found in a theatre using alternating current. By means of this scheme a change can be made from one reel to another without its being detected by the patrons.

The operator is showing the first reel of a feature film on machine No. 1 fed from the rectifier, the switch being thrown to the left. About one minute before the end of the reel is reached, he throws the switch to the right, starting the arc on machine No. 2 through the rectifier, while machine No. 1 is transferred to the alternating current circuit through the compensator, and the reel is completed in this manner. This gives the carbons on No. 2 time to burn to their proper brilliancy, ready for beginning the second reel. The process is repeated towards the end of the second reel on No. 2 machine. The procedure may be reversed if desired, that is, starting No. 2 machine on the alternating current and later throwing on the direct current.

D & W Subway Type Oil Fuse Cutout for High Tension Work

The D & W Fuse Co., of Providence, R. I., has just put on the market a primary oil fuse cutout for protective purposes in subway service. The essential principles of these cutouts are identical with the pole type of fuse cutouts made by this company and described in the Electrical Record for June, 1914. The principal changes have been the substitution of a lead gasket for the compressible gasket employed in the pole type cutout, different provision for venting the cutout and protecting it against the possibility of water entering through the vent openings, and a radically new method of arranging for connection with the cables in the two and three pole types. These cutouts are made in 50, 100 and 200 ampere capacities, single pole, and in 50 and 100 ampere capacities, double and triple pole, 2,500 volts. In the illustrations, Fig. 1 shows the three pole type, Fig. 2 the single pole type.

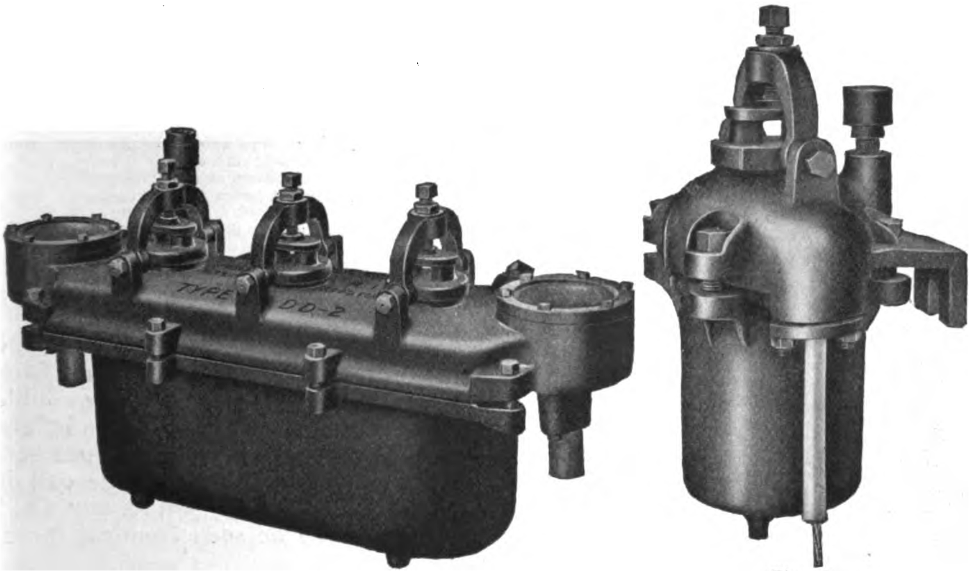


Fig. 1. Fig. 2.
Subway type of oil fuse cutout, showing method of installing in subway.
D & W Fuse Co., Providence, R. I.

The venting arrangement necessarily had to be completely modified for subway service and provision is made for connecting the cutouts to a common venting pipe. This pipe, preferably, is carried to the highest point within the manhole and from that dropped to within five or six inches of the floor; the lower end being enlarged a few inches to the size of a pipe at least twice the diameter of the original. Should water flood the manhole, the air is compressed in the cutout as it rises and prevents the admission of any water, even should the manhole be completely filled. At the same time, any undue pressure within the cutout itself, resulting from the blowing of a fuse, is promptly relieved as the pipe would only be sealed by the water at its lower end.

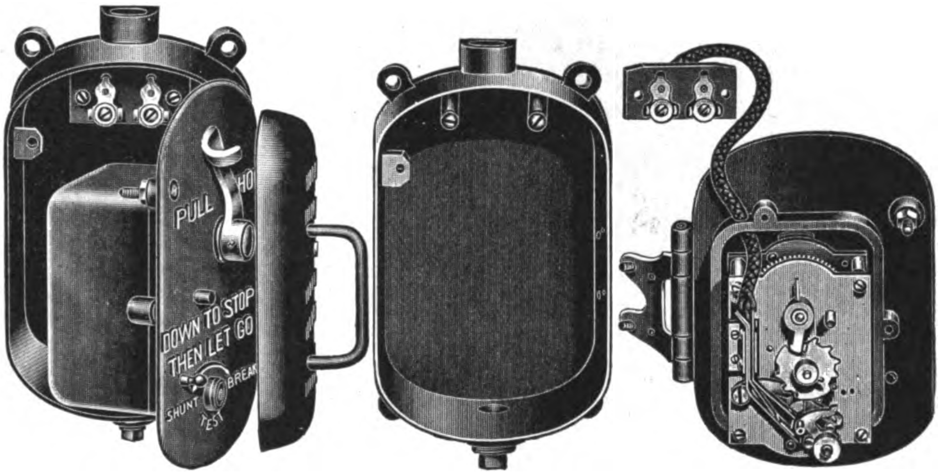
The two and three pole cutouts are equipped with a cable connection compartment at each end for the use of the two or three wire cable.

In the "D & W" cutout, the fusible element is placed under a heavy body of special oil. On the blowing of the fuse the terminals are so arranged that they are forcibly thrown apart and the oil being interposed between them, effectually prevents the formation of an arc.

The company admonishes users to employ only the fuse links which they manufacture especially for these cutouts. Ordinary fuse wire cannot be safely used as it is likely to bring about an abnormal rise in temperature of the oil, with resulting carbonization, which will rapidly destroy its efficiency. Fuses of any desired capacity from 5 to 20 amperes, up to the full capacity of the cutout can be supplied at moderate expense. A special grade of oil made for this service should be used. The oil container is provided with a plug outlet at the bottom which permits the drawing off of the oil when required.

Bunnell Jove Fire Alarm Box

The rather drastic overhauling of the fire alarm system of Greater New York has induced the manufacturers of fire alarm apparatus to develop a new line of boxes to meet the more exacting requirements of the New York and New Jersey authorities regulating such matters. Among the apparatus which



Jove fire alarm box, showing dust proof cover over mechanism, and mechanism exposed.
J. H. Bunnell & Co., Inc., 32 Park place, New York.

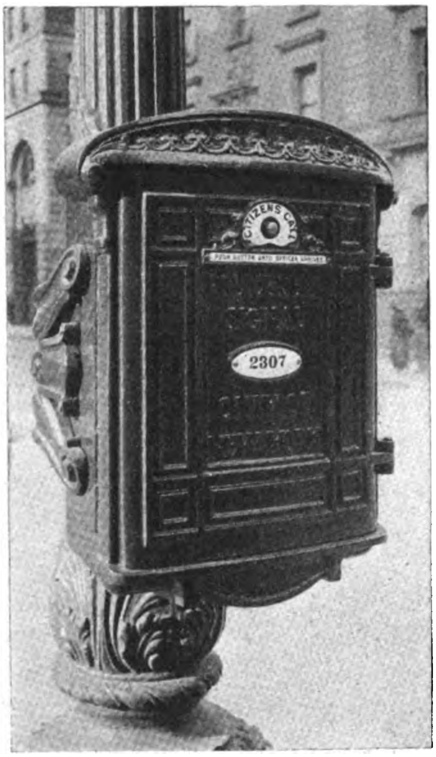
has recently come on the market is the Jove fire alarm box made by J. H. Bunnell & Co., Inc., 32 Park place, New York. This box is shown in the annexed cuts.

An outer door, with convenient grip for pulling it open protects the pull-lever from mischievous use or accidental damage. This door is normally held closed by a spring catch that yields to a pull. Opening the outer or protecting door exposes the pull-lever for transmitting alarms. When this lever is pulled down to its stop and released the alarm signal giving the special box number will be transmitted four times and cannot be interfered with by any further manipulation of the lever. If handle is not pulled all the way down to its stop the signal will not be repeated four times, but a perfect signal will be sent once when pulled one-quarter the distance; twice when pulled half, and three times on being pulled three-quarters of the way to stop, and these signals cannot be interfered with after releasing the pull-lever. A broken or imperfect signal cannot be sent no matter to what point the lever may be pulled and released from.

Police Signal System

A new system for establishing communication between precinct headquarters and a patrolman at any point on his beat, at any time, has recently been adopted in certain sections of New York and will probably be greatly extended in the near future. The equipment and operation of this system are described in the current issue of the *New York Telephone Review*.

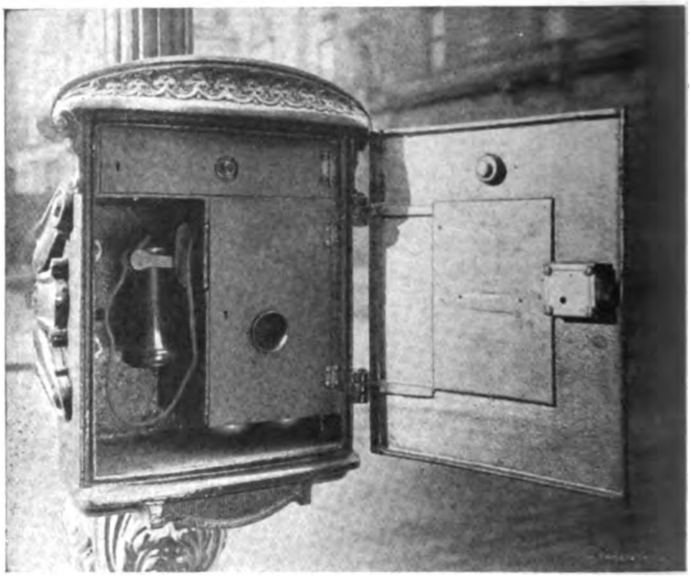
The old method of signaling to patrolmen by bells has proved uncertain, since the patrolman must often be out of hearing; nor is there any provision in this old system for the calling of a patrolman by a citizen without his first getting into touch with the precinct headquarters. The question of using a flashlight system in connnection with the telephone to summon the officer to the police boxes was then suggested. Early experiments, although not offering a real solution of the problem, showed the idea was practicable and capable of vastly improving the service.



Exterior view of the new box showing details of design. Citizen's call button and instructions for operating it. Instruction and number plates are enameled. Western Electric Co., 463 West street, New York.

To reach the heart of the problem a special box and lantern had to be designed. The New York Telephone Co. developed the box and the telephone equipment; the Western Electric Co. evolved the lantern, and the New York Edison Co., on whose poles the installations have been made, designed the architectural features of the equipment.

By means of the new apparatus it is easy for the precinct commander to call the patrolman in any zone equipped with the system. The lantern signals flash a green light which is so strong as to be clearly visible at a distance of from 1,500 to 2,000 feet even in bright sunlight. The lamp is lighted for periods of four seconds at intervals of three seconds, until the call is answered. The officer need not remain at any fixed position, for the signals can be seen from all directions.



The new box ready for inspection. This view shows the flashlight apparatus on the special mounting plate and the wiring between the flashlight compartment and the telephone compartment. The latter is equipped with a standard police box telephone unit. Both the flashlight unit and the telephone unit can be easily removed from their respective compartments for inspection and repairs. Western Electric Co., 463 West st., New York.

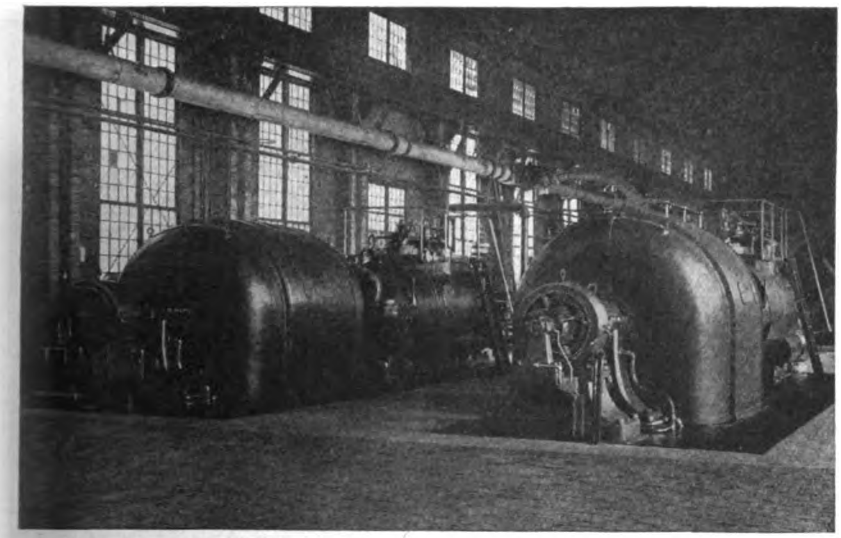
A novel feature of the new box, and one which shows a marked improvement over the old, is the citizen's call button. This is prominently located on the outer door of the box and is so wired that anyone can operate it and light the signal lamp to summon a patrolman. The operation of this button does not give a signal of any kind at the station house. It merely closes the local electric light circuit through the signal lamp.

Each of the new boxes contains, in addition to a standard police telephone unit, special signal apparatus which is connected to the telephone line so as not to interfere with the use of the line for telephone purposes after the patrolman has answered the flashlight signal. When the receiver is removed from the hook in the police box, the signaling current is automatically disconnected from the telephone line, and the line restored to its normal condition for telephoning. The ordinary telephone line signal instantly appears in front of the sergeant operating the switchboard in the station house, thus indicating that the patrolman has answered the call.

Westinghouse Direct Connected Exciters

The Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has recently perfected a line of exciters for direct service to large central station generators.

The use of the direct-connected exciter has the following advantages: each generator is dependent only upon its individual exciter, the number of plant auxiliaries is reduced, rheostat losses tend to be less, belts and belting troubles are eliminated, and a neat and compact appearance is secured. The cost of the direct-connected exciter varies somewhat with the type of main generator with which it is to be used. This is due to the varying amount of excitation required by the alternator, which depends materially on its operating speed.

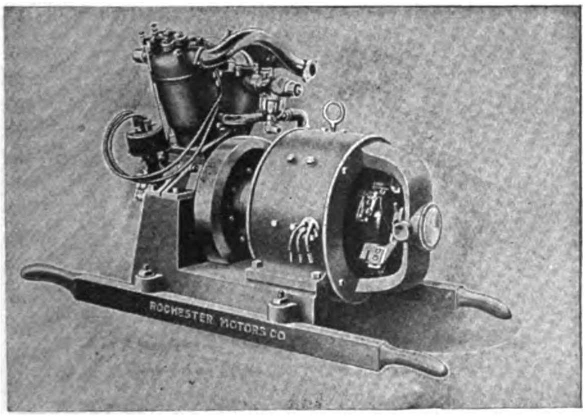


Direct connected exciters. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Several methods of mounting the exciter are employed. In the case of a vertical generator the exciter is carried by the thrust bearing bracket. With a horizontal generator, the exciter frame may be mounted on an extension of the generator bed plate, on a bracket attached to the bearing pedestal, or on a separate base.

Portable Gasoline-Electric Set

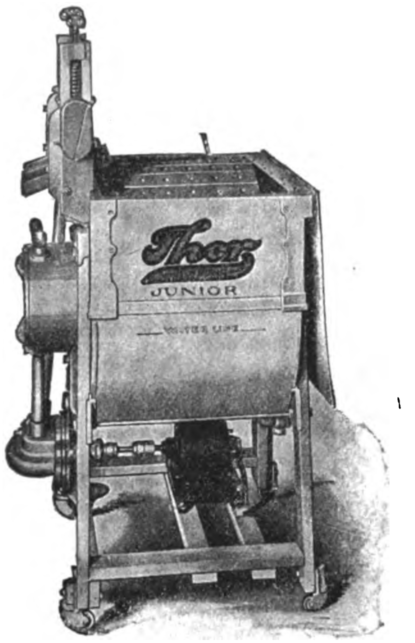
The accompanying cut shows a new portable gasoline-electric set recently developed by the Rochester Motors Co., Inc., 686-696 Lexington avenue, Rochester, N. Y. This outfit is suitable for use by contractors, by traveling shows, or any other small power users who prefer a portable generator set. It has capacity of 2 kw., may be wound either for 65 volts or 125 volts direct current, and weighs less than 400 lb. The outfit is also suitable for use on yachts and boats for operating searchlights, or in connection with operating wireless systems.



Portable gasoline-electric set. Rochester Motors Co., Inc., 686-696 Lexington avenue, Rochester, N. Y.

Thor Junior Washing Machine

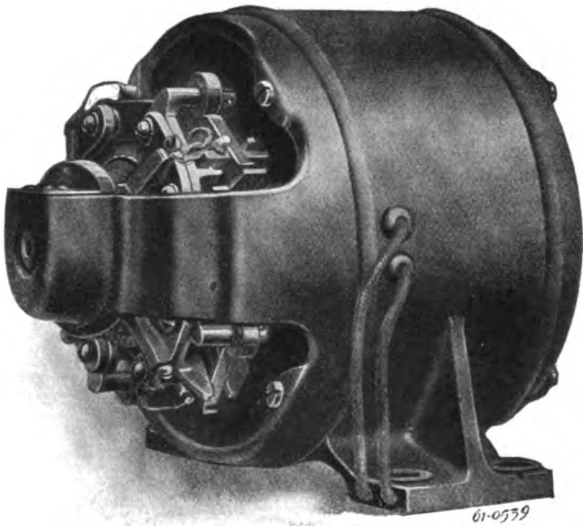
A washing machine to meet the needs of a small family has recently been added to the line of washers made by the Hurley Machine Co., 37 South Clinton street, Chicago, Ill. When not at work washing it can be used as a table. It is a cylinder type machine, white enameled, and is equipped with a wringer, safety guard, and driving motor.



Thor Jr. washing machine. Hurley Machine Co., 37 South Clinton street, Chicago, Ill.

Wagner Type NH Motor

The annexed illustration is typical of a new line of motors ranging from 1/8 to 1/4 h.p., which has recently been developed and marketed by the Wagner Electric Mfg. Co., St. Louis, Mo. This motor is especially



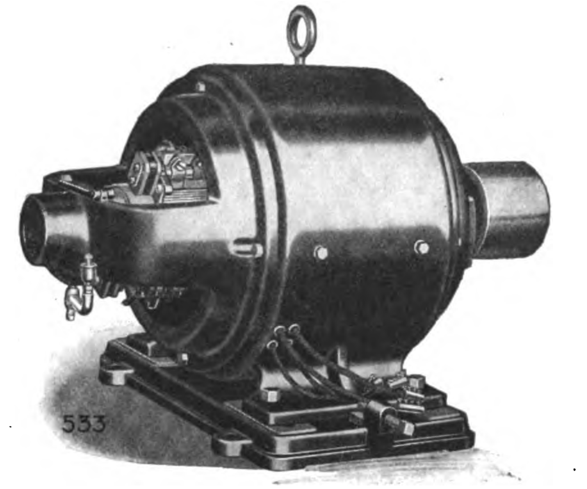
Type NH single-phase motors ranging from 1/8 to 1/4 h.p. Wagner Electric Mfg. Co., St. Louis, Mo.

adapted for household refrigerating apparatus, but its characteristics and size are such that it can also be used to operate coffee grinders, meat grinders, small pumps, garage tire pumps, vacuum cleaners, and washing machines. Like other Wagner motors its characteristics are similar to the standard single phase motor originally marketed by this company in 1897.

Robbins & Myers Direct Current Motor

The new Type C direct current motor just announced by The Robbins & Myers Co., Springfield, Ohio, is at present made in sizes from ⅛ to 3 h.p. inclusive.

The frame is cast iron and of low, squatty shape, adapting the motor for installation where the space is restricted. The bearing bracket on the commutator end extends well out from the frame and gives easy access to the commutator and brushes. The bearings are oil ring lubricated and equipped with over-flow and drain plugs.



Type C motor, 3 h.p. The Robbins & Myers Co., Springfield, Ohio.

This motor can be furnished open or fully enclosed, horizontal or vertical; for continuous or intermittent service; constant or variable speed; shunt, series or compound wound. It is made for 15, 230 and 550 volt circuits, also for service on low voltage storage battery circuits.

Each motor is regularly furnished with sliding base, no-voltage release starter and cast iron crown pulley. It can also be furnished with idler pulley or back gear attachments if desired.

Westinghouse Small Belted Alternators

For small plant service the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has brought out a new small belted alternating-current generator, direct-connected exciter.

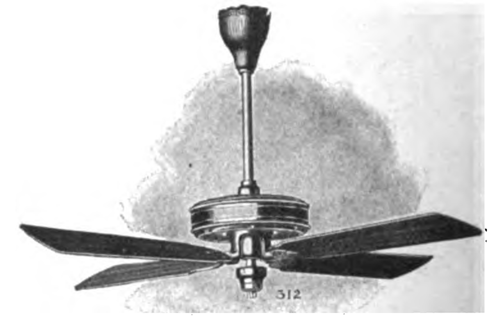
This generator has a rated capacity of 20 kva., 3-phase or 14 kva., single phase. The standard frequency is 60 cycles at a speed of 1800 r.p.m. and the machine can be furnished to give either 120, 240, 480, or 600 volts.

Robbins & Myers Alternating Current Ceiling Fan

This new fan manufactured by The Robbins & Myers Co., Springfield, O., is of the self-starting, induction type. The field coils are securely attached to the laminated steel core and are insulated from it. The rotor is built up of electrical sheet steel laminations with copper conductors securely riveted to the copper end rings.

A ball bearing immersed in oil is used. A spiral groove in the bearing acts as a centrifugal pump when the fan is operating, thus circulating the oil along the shaft continuously from the lower to the upper chamber.

The fan has four blades with a sweep 54 inches in diameter. The blade length is 23¾ inches; the width is 5½ inches at the shank end and 6¾ inches at the outer end. The blade shank is supported in the hub directly beneath the motor. The fan is regularly equipped with a 3-point, two-speed switch and regulator. The switch serves to start and stop the fan as well as to regulate its running speeds.



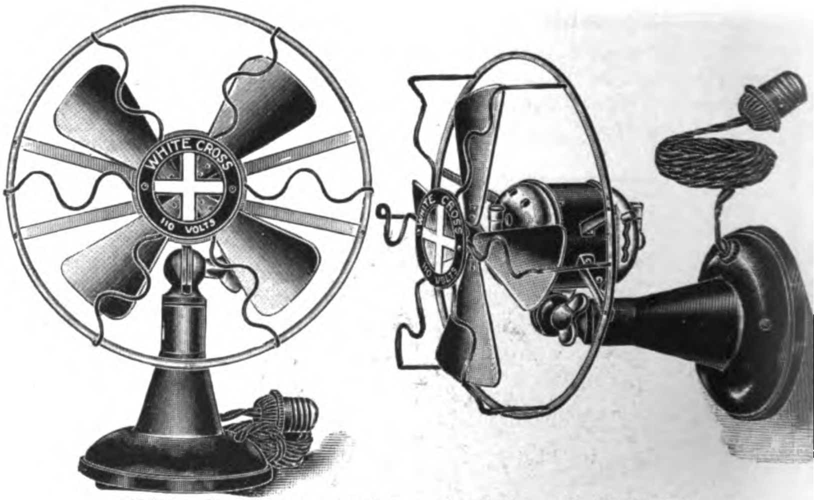
Alternating current ceiling fan. Robbins & Myers Co., Springfield, Ohio.

The fixture box has four holes suitable for standard ⅜-inch brass fixture pipe connection; and the customer can readily wire the motor and attach electrolier fittings for lights if desired.

The fan is made for 110 and 220 volts, 60 cycles, and at present is made in plain design only.

White Cross Electric Fans

Two views of one of the new line of electric fans now being offered to the trade by the Lindstrom, Smith Co., 1100 South Wabash avenue, Chicago, are shown in the annexed cuts. This is fan No. 62, for ordinary use. It weighs 6 pounds, has 8-in. blades, and will operate on direct current, or on alternating at pressures from 8 to 120 volts, any frequency.

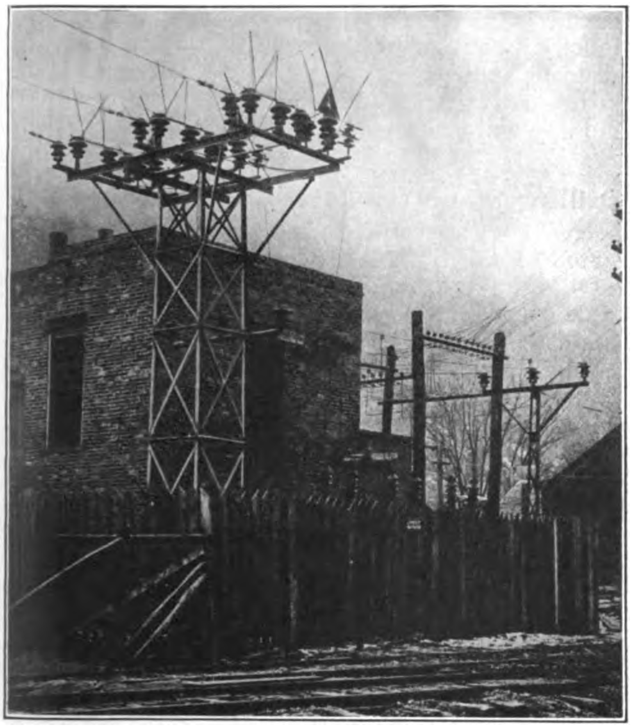


"White Cross" fans. Lindstrom, Smith Co., 1100 South Wabash avenue, Chicago, Ill.

White Cross fan Nos. 6 and 63 operate on storage battery energy, usually at a pressure of 8 volts. The "Breezer No. 60" is made of nickle and oxidized copper, and operates on either direct or alternating current.

T-E Outdoor Substation

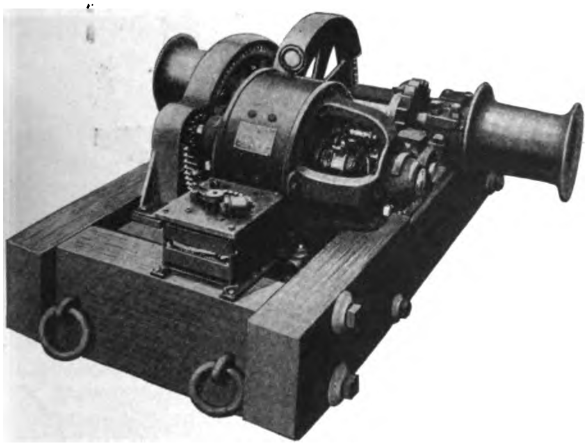
The outdoor substation pictured is one of the new designs of the Transmission Engineering Co. of Greensburg, Pa. As shown, it provides for mounting the transformers on the ground. The transmission line is dead-ended to the steel tower which carries the Burke horn gap switch, lightning arrester, and fuse. A steel pole is used to support one end of the high voltage bus wires over the transformers. The construction is simple, and is particularly adaptable where the transformers are too large to be carried on a platform above the ground.



Outdoor substation on lines of the Virginia Western Power Co. Transmission Engineering Co., Greensburg, Pa.

Dobbie Portable Winch

The construction of the New York Subway necessitated the building of the portable motor-driven winch shown in the illustration. It has, however, since demonstrated its usefulness in many other fields.



Portable Winch driven by Westinghouse Motor.

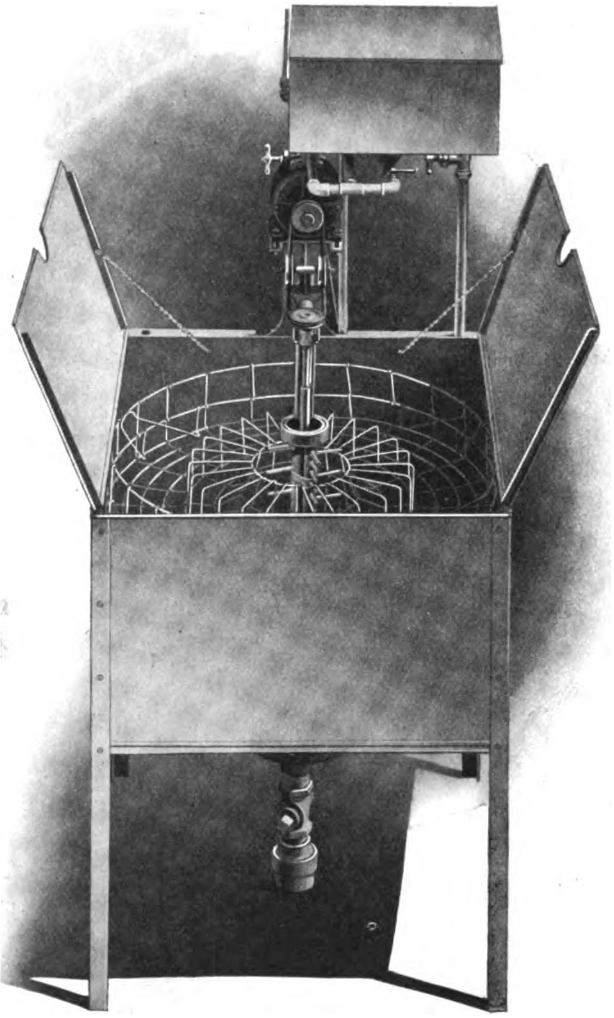
When used for lifting material out of the Subway a trestle or light frame work carrying a sheave is placed directly over the opening. The hoisting rope is passed over the sheave, given two or three turns around the friction drum, the motor started and the slack paid off as the material is hoisted. When used to assist teams in hauling loads up heavy grades, one end of the rope is fastened to the wagon tongue and the other end given several turns around the friction drum. Current is obtained from the 550-volt trolley circuit.

The winch is manufactured in two sizes by the Dobbie Foundry and Machine Co., Niagara Falls, N. Y. The small outfit operates at a rope speed of 152, and the large one at 178 feet per minute. Westinghouse compound-wound type SK motors of 5 and 7½ h.p. respectively are used to drive these outfits.

"Nevernick" Dishwasher

This motor driven dishwasher has just been put on the market by the Domestic Utilities Co. of Newark, N. J. This machine is said to be equipped to perform every operation in scouring dishes, from serving as a source of boiling water to drying the dishes and automatically cleansing the machine.

The "Nevernick" is 30 inches square and is designed to be attached to the water supply and sewer connections as a permanent fixture. The motive power for pumping the water and driving the spraying mechanism is furnished by a ⅛ h.p. motor either alternating or direct current. It is also made in a



"Nevernick" electric dishwasher, showing upper racks and revolving jets for washing and rinsing. Upper tank is used for heating required quantity of water to boiling point. Domestic Utilities Co., Newark, N. J.

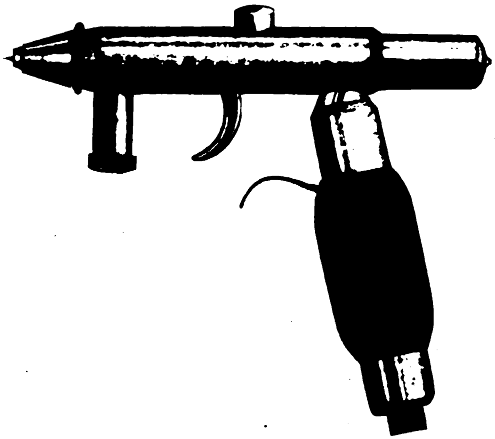
round type, of the same general dimensions as the square type shown in the cut.

Boiling water, the first requirement of a successful dishwasher, may be obtained in the heating tank of the machine by either gas or electricity. Only 4 gallons are required for the complete operation. Washing is done by two gallons of hot soapy water over a period of 5 to 10 minutes, means being provided for maintaining its temperature at boiling during the operation. The remaining two gallons of boiling water serve to rinse the dishes and the machine and pass directly to the waste.

Price Automatic Air Brushes

Two of the several new types of air brushes made by the Price Air Brush Co., of Indianapolis, Ind., are shown in the accompanying cuts. This concern makes eight different models of such brushes, each of these models in turn being made in three different sizes—one-half pint, pint, and quart capacity, respectively.

The automatic model A brush shown in Fig. 1, is equipped with 10 feet of air hose complete, 10 feet of special metal material tubing, one 2-gallon container with cover, an agitator with 10-foot hose connection and tackle for holding container, and 1 pint bottle.



Model A sprayer. Price Air Brush Co., Indianapolis, Ind.

Model E sprayer. Price Air Brush Co., Indianapolis, Ind.

The characteristic feature of all these sprayers is their economy of time, attention, and spray material. All spray effectively, using a minimum amount of varnish lacquer or enamel. They work on the atomizing principle.

In addition to the brushes this company also makes a spraying booth for use in connection with them. This model is best adapted for general use in plants where large amounts of varnish, enamels, and shellacs are used.

Model E is best adapted for portrait varnishing, and for enamels and lacquers where instant changing of the spray is not required. The coloring nozzle is adjustable to any width of spray.

Drilling Stand for Portable Electric Drill

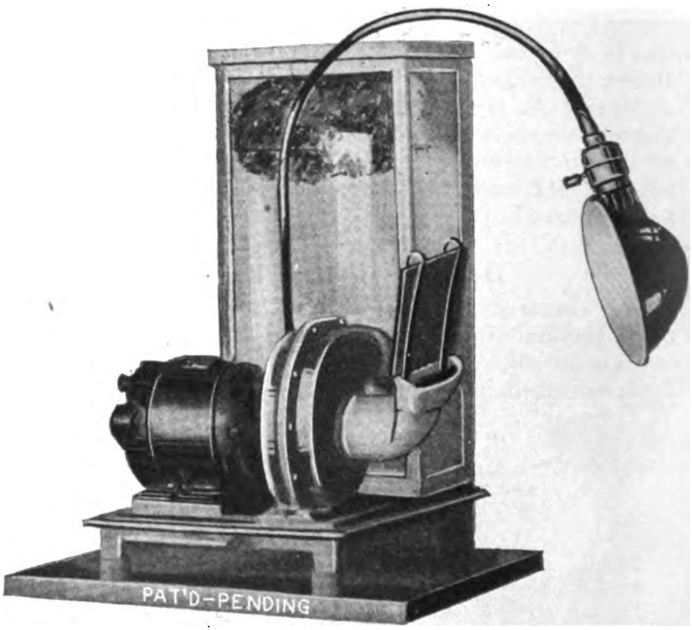
A new drilling stand or "old man" is now being marketed by the Standard Electric Tool Co., Cincinnati, Ohio, for use in connection with its high power portable electric screw feed drills.

This drill is made in two sizes for the ½ in., ⅝ in., and ¾ in. drills, and also for the ⅞ in, 1 in., and 1¼ in. drills. These drills are made to operate on either direct or alternating current. The weight of the small stand is 50 lb. and the large stand 75 lb.

This attachment is particularly adapted for any place where a lot of heavy drilling is to be done with portable electric tools.

Vogel Fly Catcher

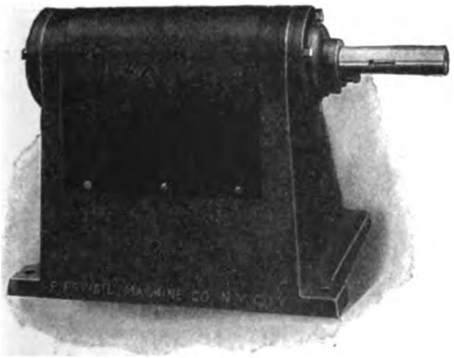
To check the fly industry, an industry that produces five trillion baby flies per mother fly between April 15 and September 10, the Vogel Products Mfg. Co., 1616 Chestnut street, St. Louis, Mo., has developed the motor driven fly catcher shown in the annexed cut. It consists of a motor, fan, clasp, cage mirror, metal plate, light, and stand. It weighs 30 pounds, and consumes about 50 watts. During the day the opening is baited with some sweet stuff; during the night the light is the bait, the reflector throwing the rays directly on the opening. Another form of this device has a combination cage for air cleansing. The time to start the fly catcher, says the maker, is not in midsummer when flies multiply faster than they can be killed, but early in the spring, before the fly factories open up for the season.



Electric fly catcher. Vogel Products Mfg. Co., 1616 Chestnut street, St. Louis, Mo.

Pryibil Bench Buffer

The P. Pryibil Machine Co., 512 West 41st street, New York, is now offering the silver, gas, and electrical fixture trades the new ball bearing bench buffer illustrated herewith. It is easy to arrange in series on benches with countershaft drive underneath. Friction is at a low ebb in this machine. The spindles will be furnished by the company to suit special requirements of any concern without any extra charge, providing the arrangement and style of spindle required is not too elaborate. This machine has been running under severe tests in some of the silver factories 10 hours a day for 2 months.

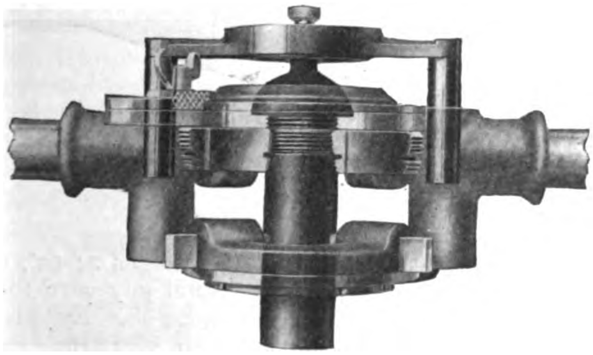


Buffing machine. P. Pryibil Machine Co., 512 West 41st street, New York.

"Beaver" Crossbar Die Stock

The crossbar die stock shown herewith is an addition to the line of Beaver easy working die stocks manufactured by The Borden Co., of Warren, Ohio. This tool threads ½ to 1¼ inches. A bar extends across the top of the tool carrying a plug which rests on the end of the pipe. The dies are made in two sections.

The lower section does the rough work of starting on the pipe with teeth especially formed for this purpose. The die remains stationary during starting. After the upper section begins to cut this lower die gradually withdraws from the pipe.



Beaver crossbar die stock. Die stock cut open to show operation. The Borden Co., Warren, Ohio.

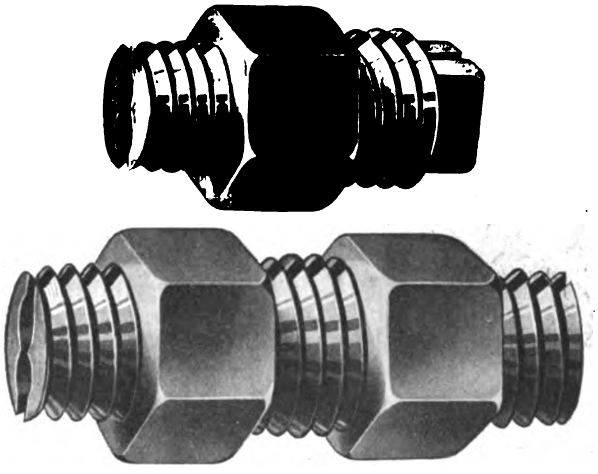
The upper die is a narrow receding die and constantly opens as the thread is cut, producing a standard pipe thread. These dies insure correct thread pitch without a leader screw.

The operation of the tool is simple: the dies are set by the handle shown, and pipe threaded without attention by the operator. To cut another thread the crossbar is simply pushed down, which re-positions the tool. The manufacturers claim this tool is the simplest and most durable tool ever placed on the market. The body of the tool is made of practically one piece with wide openings to allow chips to get away and for free oiling facilities.

A universal guide centers all sizes ¼ to 1¼ inch. The tool is furnished with double-ended reversible dies ½ to 1¼ inch; extra ¼ by ⅜ inch dies can also be furnished, and all sizes of dies either right or left hand.

Gund High Tension Guy Clamp

In this clamp the body is split lengthwise into halves, each of these halves being also doubled grooved lengthwise so as to grip the guy wire over which the halves are fitted when in use. The outside of the halves of the clamp has a tapered thread, being large in the middle and smaller at both ends. The binding nuts also have a tapered thread, with the result that when they are screwed towards the middle of the clamp they cause the split halves to impinge on the guy wire. The taper is 10 to 1. This means that screwing up the nut 1 inch forces the two halves of the clamps one-tenth of an inch closer together.



Single nut and double nut high tension guy clamps. Gund Mfg. Co., La Crosse, Wis.

This clamp is made in two styles. Single clamps with one nut are for use on all sizes of guy wire and strand up to ⅜ inch. Double clamps with two nuts are for ⅜, 7/16, and ½ inch guy wire and ⅝ inch strand. They are made by the Gund Mfg. Co., La Crosse, Wis.

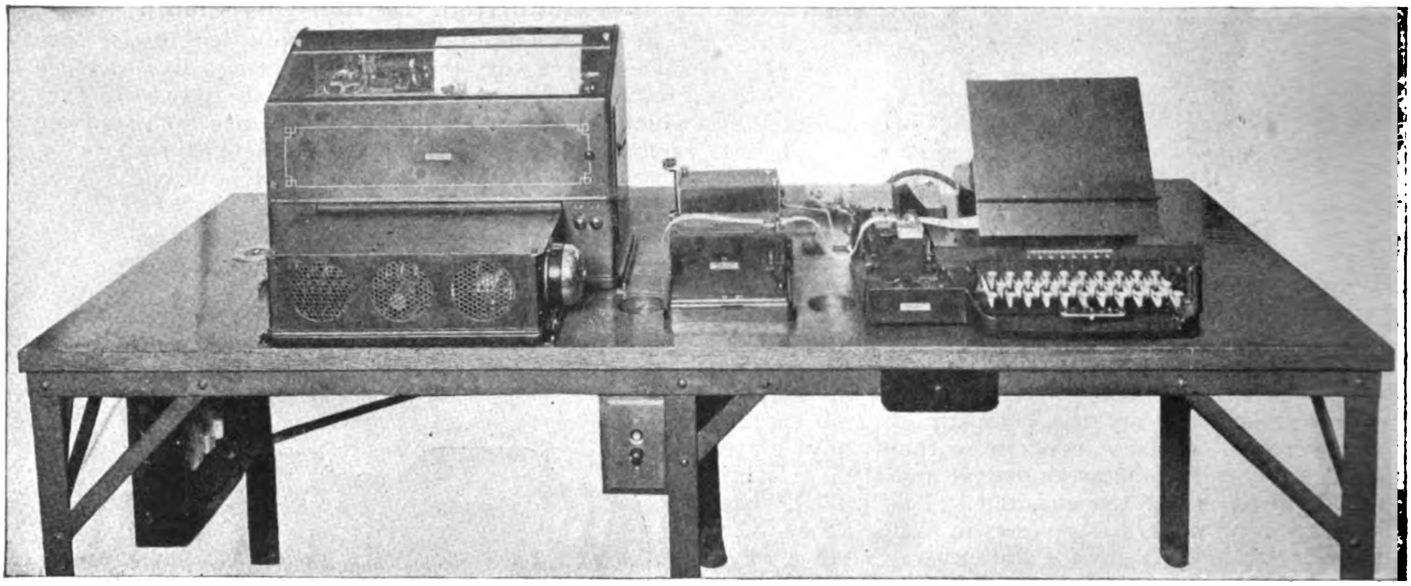
Western Electric Printing Telegraph

The Western Electric Co., 463 West street, New York, has just placed on the market a new printing telegraph system. By this system, a message, written upon a modified form of typewriter at one end of a telegraph line, is automatically printed, ready for delivery, at the other. Furthermore, not only one, but *eight* messages may be sent simultaneously over a single wire, each message being printed as fast as the sending operator can typewrite it. A trial installation of this system, made by the Western Union Co., has been operating between New York and Boston for the past year and a half, and has been working practically day and night, frequently at a total speed of 360 words a minute.

The flexible and simple nature of this system makes it suitable to meet the demands of large operating telegraph companies. It also permits it to touch entirely new fields. A number of printers operated from one keyboard may be used for distributing orders and information to a number of departments. When an order is received calling for items from several different departments, it will be sent out over the short line printer to all departments simultaneously, enabling them all to begin assembling material at once.

Modifications of the system are particularly well adapted for news distribution service. It can send out news much faster and in much greater detail than the present "ticker" system. A news syndicate, for example, by installing telegraph printers at the offices of the newspapers using its service, can send a news story to all of its subscribers at once; moreover, the story will be received written out in full, just as it is to be printed, without the necessity of having a telegraph operator at every newspaper office, to translate dots and dashes into words, and to decipher the sometimes puzzling abbreviations of newspaper telegraph codes.

These are by no means all of the possible and probable uses of this system. There is hardly a business or profession, involving the transmission of messages, to which it would not be a valuable adjunct. Briefly this new system is ideally adapted for use in any system of intercommunication that requires a written record of messages.

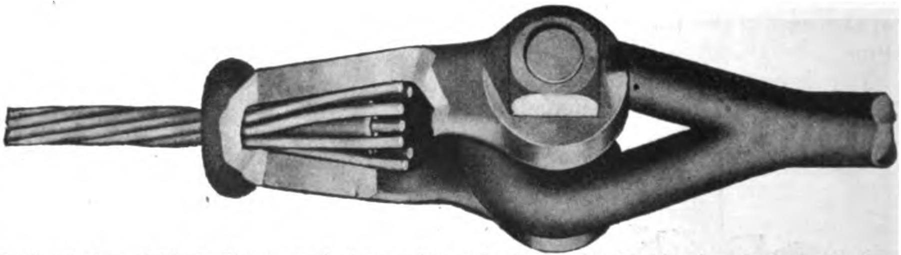


Rapid printing telegraph system. Western Electric Co., 463 West street, New York.

Marchand Clevis, Twin, and Pole Clamps

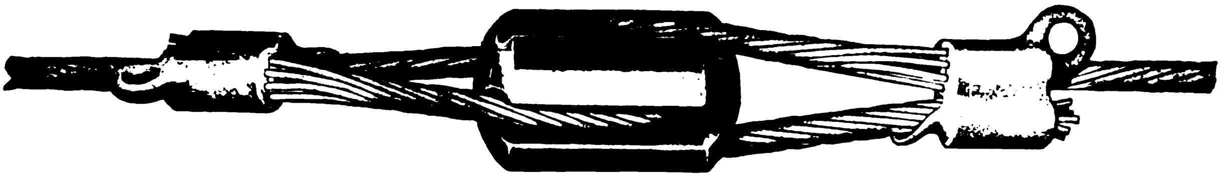
A new line of Marchand clamps for stranded wire has just been put on the market by the Steel City Electric Co., 1207-1219 Columbus avenue, Pittsburgh, Pa. The accompanying cuts show several of these clamps, the purpose for which each clamp is used being indicated in the caption under the cut. Marchand clamps are galvanized by the sherardizing process to prevent rust, and can be furnished for any number of strands. Clamps for 7-wire strand are made in three styles; namely, Clevis clamps, twin clamps, and pole clamps. Each style is made in two sizes, for light and for heavy work.

The clamp proper consists of a conical shaped socket and conical wedge. The conical wedge is slotted to allow compression, and has a hole through the centre for the core or centre wire to pass through. The large size Clevis clamp for 7-wire strand weighs 24 oz., and will easily hold ½-inch, 7-wire strand guy wire to its approximate breaking point of 22,000 lb. Expansion and contraction are said to have no effect on these clamps. The small sizes of clamps of each style for 7-wire strands will take all sizes of strand up to and including ⅜ inch diameter. The large sizes will take all sizes up to and including ½ inch diameter. The size of conical wedge, or plug hole through the centre, varies according to the size of wire to be used.



Sectional view of Clevis Clamp attached to anchor rod. Illustrating Marchand method of clamping guy wire. Core wire is clamped in center of tapered plug and the six sheath wires are clamped between tapered plug and wall of tapered socket in Clevis casting. Note the raised sloping projection on outer end of Clevis forming the nut lock. Steel City Electric Co., 1207-1219 Columbus avenue, Pittsburgh, Pa.

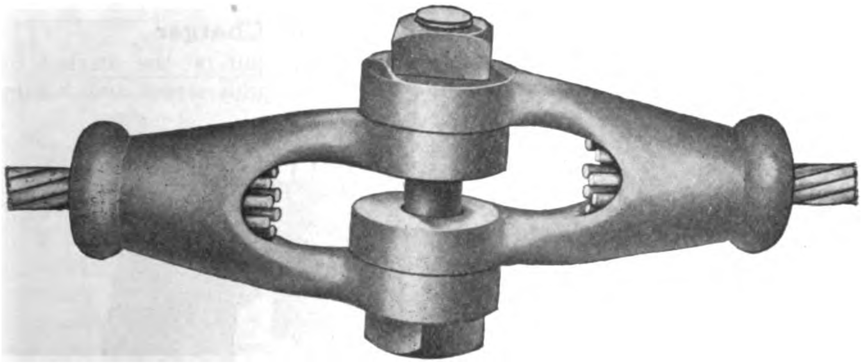
Marchand twin clamps consist of a double tapered socket casting and two tapered plugs, and are so con-



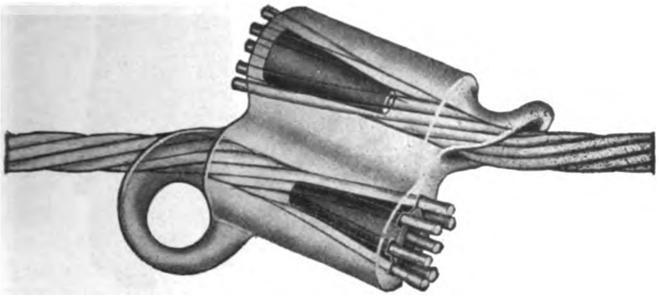
Twin clamps adapted to "White" strain insulator. Steel City Electric Co., 1207-1219 Columbus avenue, Pittsburgh, Pa.

structed that one side of the clamp pulls against the other. These twin clamps can also be used effectively as a pole fastener. Used in this way only one clamp and the minimum amount of guy wire are required.

Marchand clamps for the dead-end or anchoring of stranded copper and aluminum conductors are made in the Clevis style only. This clamp can also be used for supporting feeder cables in wire shafts of high buildings. The tapered plug of this clamp differs slightly from the tapered plug for a 7-wire strand. It is designed for standard 61-wire concentric strand cable.



Method of splicing with two clevis clamps. Steel City Electric Co., 1207-1219 Columbus avenue, Pittsburgh, Pa.

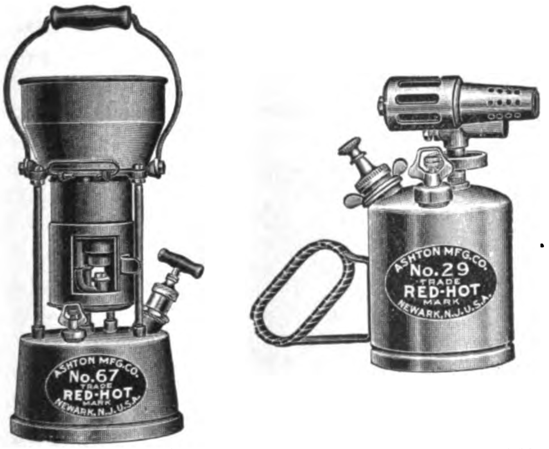


Methods of splicing with twin clamps. Steel City Electric Co., 1207-1219 Columbus avenue, Pittsburgh, Pa.

Ashton Kerosene Fire Pot and Torches

The Ashton Mfg. Co., of Newark, N. J., is about to add to its line of "Red Hot" products a No. 67 kerosene fire pot, a No. 29 kerosene torch, and a No. 30 kerosene torch.

The burner of the fire pot is fitted with a detachable jet block, which is removable, enabling the operator to clean the burner readily should it become clogged from the impurities in the kerosene. A large automatic brass pump in the tank supplies the required air pressure. The filler cap is fitted with an air releasing screw which is used to let off the pressure and to extinguish the flame.



No. 29 kerosene torch and No. 67 kerosene fire pot. Ashton Mfg. Co., Newark, N. J.

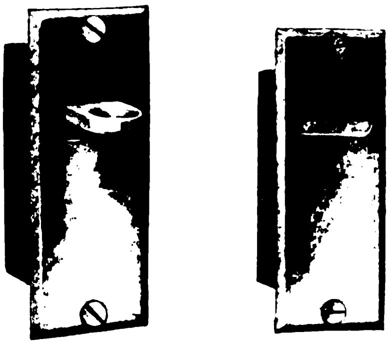
In the No. 29 kerosene torch the tank is made of heavy seamless drawn brass with heavy bottom and fitted with large automatic brass pump. The filler cap is fitted with an air releasing screw to reduce the pressure and extinguish the flame. The burner produces a blue flame that will melt a ¼-inch copper rod.

The No. 30 kerosene torch is of one pint capacity, the No. 29 being one quart size.

Hartman Automatic Lighting Switch for Use on Automobiles

An automatic lighting switch which gives to the automobile wiring system the same protection afforded by the automatic circuit breaker on power and lighting circuits has been brought out by the Hartman Electrical Mfg. Co., of Mansfield, Ohio.

The present practice is to use a lighting switch for controlling the various lamp circuits and protect the battery against grounds by means of a fuse at each circuit. The automatic switch combines these two functions. As a lighting switch it is opened and closed by means of a lever, corresponding to the usual push button. In closing the switch, the lever is depressed and is retained in this position by means of a toggle lock. Should a ground or short circuit occur, an armature within the switch case acts on the lock and instantly opens the circuit.



Single unit automatic switch with lever in operation. Current indicator

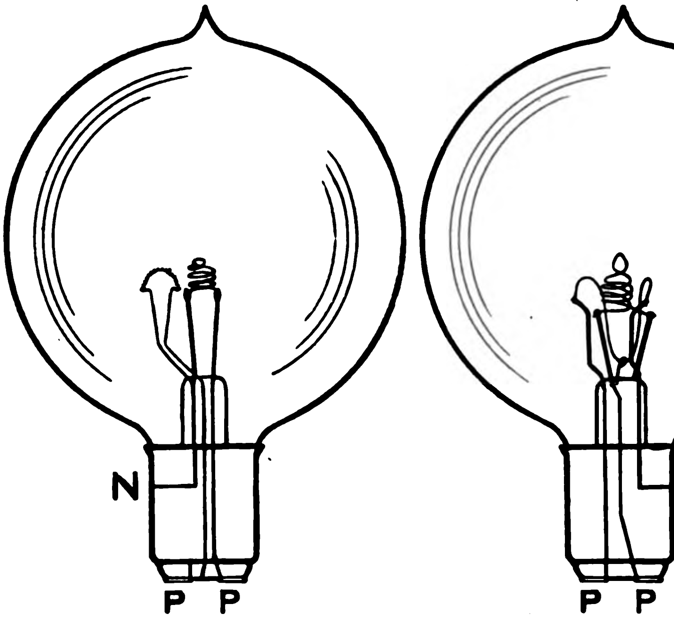
Two new electric specialties for automobiles. The Hartman Electrical Mfg. Co., Mansfield, Ohio.

This company has also developed a new current indicator which it is claimed can be more easily read from the driver's seat than other makes. This is due to the fact that the lettering is horizontal instead of vertical as on the usual round type of instrument. To further facilitate the reading of the letters the "charge" position shows black, the "discharge" shows red, and the "off" shows white. The same containing case is used as on the automatic switch, so that the indicator can be mounted with the switches, a single face plate covering all instruments.

This instrument can likewise be installed independently in connection with lighting switches of other makes.

Tulite Auto Bulbs

Tulite automobile bulbs have been put on the market to meet the demand for sidelights that will conform readily to both city regulations and the need of powerful headlights on country roads. One bulb with two separate filaments is the solution in this case. The standard bulb made for this double purpose contains a 4 candlepower filament for city use and a 20 candlepower for country use. It is made in two types: in Type R bulb the minor filament is placed directly above the major; in Type A the minor filament surrounds the major. If a car is already fully wired and equipped with sidelights, the owner can simply carry his sidelight wires to the headlights to operate the city filament, using the regular two point connector for the two lead wires and one return wire common to both leads, or ground the return on the frame of the machine. To wire a car complete, wire in the regular way for the headlights only and carry one extra wire to the headlight to operate the low candlepower filament, using two point connector and return as above. Omit all sidelight wiring. Use same switch as when operating sidelights. These bulbs are made by the Tulite Auto Bulb Co., 1104 Dime Savings Bank Bldg., Detroit, Mich.



Tulite bulbs for motor cars. Tulite Auto Bulb Co., 1104 Dime Savings Bank Bldg., Detroit, Mich.

Hertner Electric Charger

This is a motor-generator device for charging electric car storage batteries. During the night, should the line voltage drop or cut off for an interval, which often occurs with the mercury rectifier, the apparatus continues to operate, the generator acting as a motor with a slight draught of current from the battery until the line voltage again comes on when the machine resumes its work. Interpoles are provided to take care of commutation under all conditions.

A fan mounted in the middle of the machine causes a draught of air, which with its cooling effects more than offsets the power used to run it, on account of the reduced copper losses due to running at low temperature.

The rotor windings are made without any joints, eliminating the one great source of trouble in the induction motor. The plant as shown, is vertical, permitting it to be located in places where a horizontal outfit would be out of the question on account of limited floor space. A further advantage is that it makes the commutator more accessible.

It is made by The Hertner Electric & Mfg. Co., Cleveland, Ohio.

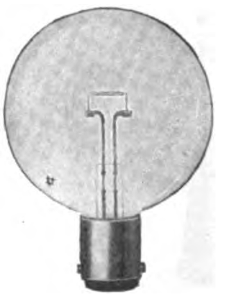
Lincoln Electric Charger

The electric charger recently put on the market by The Lincoln Electric Co., East 38th street and Kelley avenue, Cleveland, Ohio, is shown in the accompanying illustration. Briefly it is a simple form of motor-generator. The motor operates at line pressure, and causes the generator to give the pressure or voltage at which the storage battery is most efficiently charged. Battery manufacturers find that batteries charged without gasing will give maximum service and mileage, and they insist that their batteries should be so charged. The Lincoln electric charger, it is claimed, provides for this automatically, because, although the charge starts at 35 amperes it rapidly drops down to 20 amperes, then as the battery becomes charged, to 3 to 7 amperes, and continues at this rate until cut off.

Motor-generator set for sparking batteries. Lincoln Electric Co., East 38th street and Kelley avenue, Cleveland, Ohio.

Interstate Nitrogen Auto Lamp

A line of nitrogen filled lamps for use on automobiles is now being marketed by the Interstate Electric Novelty Co., 29-31 Park place, New York. They are all of the tipless variety. The candlepowers range from 16 to 100, the voltages from 6 to 8. These lamps can be supplied only with single or double Ediswan base.



Nitrogen filled automobile lamp. Interstate Electric Novelty Co., 29-31 Park place, New York.

AUTOMOBILE MATTERS

ELECTRIC VEHICLES—ELECTRICAL APPLIANCES FOR CARS, TRUCKS, AND GARAGES—NEWS AND ITEMS ABOUT THIS ACTIVE BUSINESS.

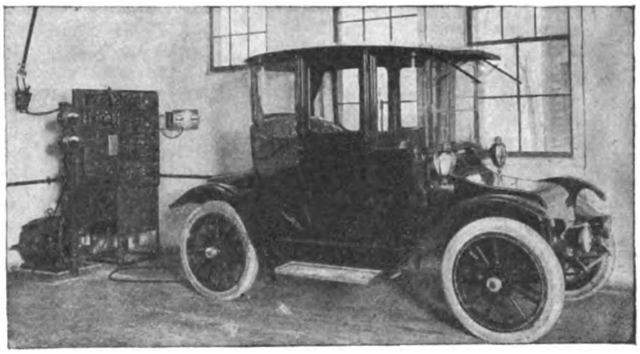
The "jitney" bus service has come to stay, says H. H. Franklin, maker of the Franklin car, and the rapid development of public automobile transportation during the next five years will be another wonder in the marvellous progress of the automobile. While at the present time the "jitney" bus is any old automobile, he adds, it will not be long before cars adapted to the service will appear. The service will not be confined to cities. It will eventually cover the country from city to village and village to city, as do the interurban railways. The development of the "jitney" service cannot be stopped, because it is going to be quicker, more convenient and in the long run cheaper.

In the recent pint fuel economy test, conducted by the Light Car Club of New Jersey, at Hackensack, two Saxon cars won first and second prizes, both going four and three-quarter miles on a pint of gasolene, an average of thirty-eight miles to the gallon. The course was a mile and a fifth in length, of which half a mile was uphill. As gasolene on the day of the test was selling in Hackensack garages at 12½ cents a gallon, the fuel cost a mile was less than a third of a cent. In all the Saxons took five firsts, five seconds and four third prizes.

J. F. Lincoln, vice-president of the Lincoln Electric Co., of Cleveland, Ohio, has been driving for three years a model 18 Detroit roadster equipped with 24 cells of 11 plate Philadelphia battery. In the last two years the gravity of these cells has not been taken, and they have received no attention outside of the charging which is necessary. He has driven this car over 11,000 miles. There is no doubt that the mileage life of this battery will be in excess of 15,000 miles, and there is also no doubt in his mind that the reason for this is the fact that the battery has never been warm under charge and has also never gased under charge. A neighbor who has a car of the same make with the same size of battery, although in a different model, has made his first replacement at the end of 6,250 miles, and will very shortly have to make his second replacement of his battery. This is being charged by a different type of apparatus and in a great many instances has gotten dangerously hot and also always finishes at a badly gasing rate.

The new co-operative electric garage of the New York Electric Vehicle Association, at Central Park West and 62nd street, is now in full operation with 100 electric pleasure cars housed and cared for. The task of putting the largest electric garage in New York City has been accomplished by the New York Electric Vehicle Association with the aid of the three leading makers of electric pleasure cars, Detroit, Baker, and Rauch and Lang, all of whom have made the new garage their New York headquarters with handsome showrooms on the avenue. The association takes entire charge of the running of the garage from leasing the building to billing the car owners. The cost of keeping a car at the garage averages approximately $45 per owner, including service, care, charging, and boosting. The charging switchboard controls 48 charging outlets of varying voltages. The meters have a capacity of 200 kilowatts, almost enough to warrant a special panel in a generating station, and two 750,000 c.m. cables carry the service into the building. These cables have a combined capacity of 3200 amperes and 120 volts or 400 kilowatts. The garage has a total floor space of 30,000 square feet, more than half of which is devoted to the storage of cars and the rest to offices, service and stock rooms, and repair shops. The equipment takes care of batteries ranging from 24 lead cells with a charging rate of 8 amperes, to the 60-cell Edison batteries requiring 100 amperes. The average charging time is from four to six hours.

Unit type sectional charging rheostats of Cutler-Hammer make have been installed in a number of electric garages in the vicinity of Boston during the past few months. Direct current is provided for charging by Wagner rotary converters, as the service in each case is from single phase alternating current lines. The accompanying cut shows the Corey Hill garage, Brookline, Mass. The charging outlets are fed by conductors carried in the conduit shown on the wall about three feet above the floor.



Battery charging equipment, Corey Hill Garage, Brookline, Mass. Cutler-Hammer unit type rheostats installed here.

The "Vulcan" electric gear shift made by The Cutler-Hammer Mfg. Co., of Milwaukee, has already been adopted by some of the best known automobile manufacturers of the country. Definite announcements have been made that the electric gear shift will be furnished on the Winton, Jeffery, L. P. C., and Pullman when specified. It does away with the lever and permits changing gears by means of push buttons located on the steering wheel. Several other prominent automobile manufacturers, the names of which cannot be mentioned at this time, are preparing to supply this device with their cars in the future.

MOTOR·MARKETS

USES FOR MOTORS, GROUPED ACCORDING TO STATED HORSE-POWER LIMITS.

175 Uses for Motors of From 1-3 to 1 Horse Power

The following devices are capable of being operated by motors of from ⅓ to 1 horse power, on 110 and 220 volt circuits:

Air compressors
Bakers machinery
Baling presses
Band saws
Battery chargers
Beamers
Beveling machines
Biscuit cutters
Blowers (medium)
Bolt and nut machines
Book compressors
Book stitchers
Bookbinders machinery
Boring machines
Bottle crowners
Bottle fillers
Bottle labelers
Box machines
Bronzing machines
Buffing lathes
Cabinet saws
Cake mixers
Candy machinery
Canning machinery
Case making machines
Casing-in machines
Chain block hoists
Chair machinery
Chocolate mixers
Churns
Cigarette machines
Circular saws
Cloth splitting machines
Coal conveyors
Coffee grinding machines
Coffee roasters
Cold saws
Collar shapers
Collar and cuff ironers
Collar and cuff starchers
Column saws
Conveying machinery
Conveyor dryrooms
Corn shellers
Cream stirrers
Cut-off saws
Cylinder shavers
Dairy apparatus
Deep well pumps
Drills
Drill grinders
Drill presses
Drug mills
Drying drums
Dye house machinery
Egg beaters
Emery wheels
Etching machines
Extractors
Fabric looms
Feed grinders
Feed pumps
Fertilizer mixers
Flour blenders
Folders
Forge blowers
Foundry oscillators
Garage pumps
Gate valves
Glass grinders
Glove polishing machines
Glue machinery
Grinders
Hack saws
Hammers
Hat making machinery
Hay cutters
Hotel dishwashers
House pumps
Ice cream freezers
Ice saws
Inclinable presses
Index-page cutters
Ironers
Jewelers' bench drills
Jewelers' polishing benches
Jig saws
Jointers
Job presses
Knitting machines
Lapidaries' wheels
Lathes
Leather measuring machines
Lime wheels
Line bevelers
Linotypes
Looms
Machine tools
Mangles
Meat grinders
Metal cutting saws
Metal shaving machines
Metal working machinery
Milkers
Mold driers
Molders
Money counting machines
Monotype casters
Nailing machines
Numbering machines
Oat crushers
Oil separators
Ore separators
Organ blowers
Paper punches
Pattern drills
Pattern lathes
Peanut roasters
Photo-engraving machines
Piano rubbers
Pipe cutters
Pipe machinery
Planers
Plate curving machines
Pleating rolls
Portable millers
Positive press. blowers
Post drills
Power saws
Press feeders
Printing presses
Pulverizers
Punch presses
Refrigerating machines
Rivet spinning machines
Rotary pumps
Rotary screens
Routers
Ruling machines
Saws
Saw grinders
Saw trimmers
Scene hoists
Screw cutting lathes
Screw machines
Seam dampeners
Shallow well pumps
Shapers
Shears
Shirt body ironers
Shoe machinery
Shooting gallery targets
Sliding head drills
Starchers
Starch mixers
Stone dressers
Stripping machines
Surfacing machines
Taping machines
Textile machinery
Thread machines
Tipping machines
Tire pumps
Tire setters
Track grinders
Triplex pumps
Tube cutting machines
Tumbling mills
Vacuum cleaners (stationary)
Vegetable peelers
Ventilating fans
Warpers
Washing machines (commercial)
Windlasses
Wood turning lathes

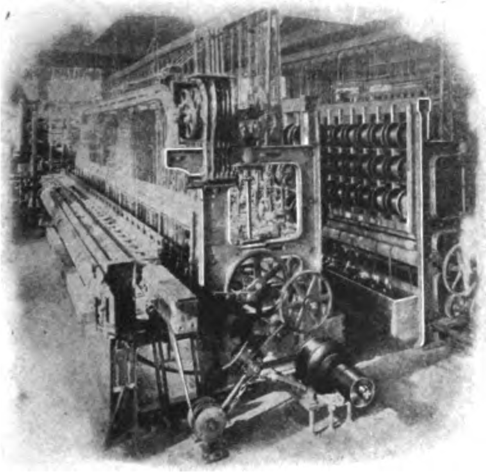
The illustrations show how motors are used for operating a number of these devices, and the captions give definite information as to the exact horse power of the motor shown in each case.

Motors of From 1-3 to 1 Horse Power

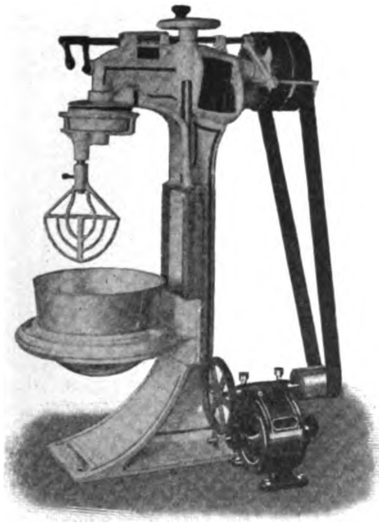
[MOTOR DRIVE SERIES—ARTICLE NO. 42]

In the accompanying table 175 devices are listed which are capable of being operated by motors of from ⅓ to 1 horse power. It will be found, however, that various sizes of these devices may require, in smaller sizes, motors of from ⅛ to ¼ horse power, and in larger sizes, motors of from 1½ to 3 horse power. That is, it is not to be assumed for instance that a punch press always requires a motor of from ⅓ to 1 horse power. Depending upon the size of the press and the character of the work done, the requirements will vary from less than ⅓ horse power, to perhaps over 3 horse power. It will be noticed that practically all the devices listed are for commercial or industrial use as very few office, hotel, and household devices require motors of over ¼ horse power.

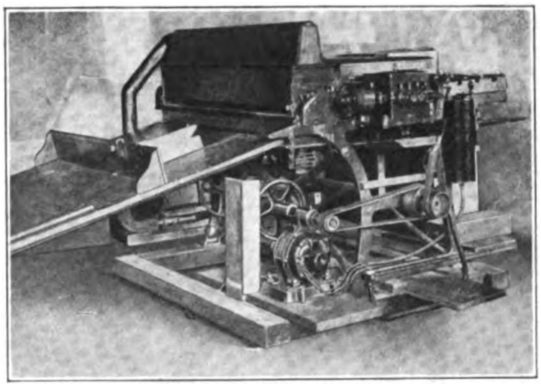
Many of the devices mentioned in the table are illustrated, the caption under each cut giving information as to the horse power, voltage, and speed of the motor shown, and where possible the name of the maker of the machine operated, and its size or capacity is also given.



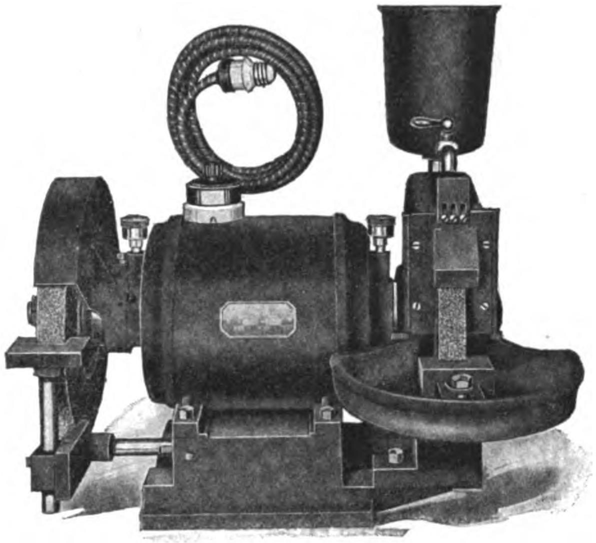
½ h.p., 700 r.p.m., 220 volt, d.c. motor with magnetic brake for quick stopping, made by The Mechanical Appliance Co., Milwaukee, Wis., operating a narrow fabric loom.



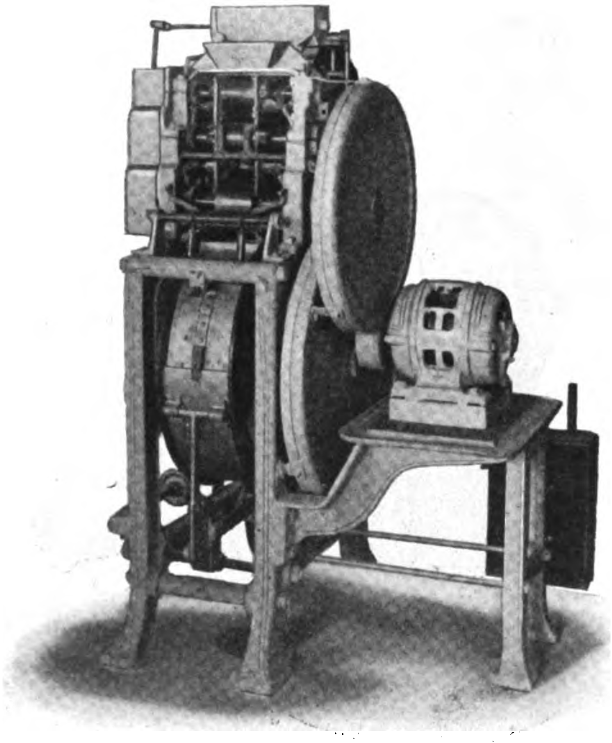
½ h.p., 220 volt, back geared motor, made by The Fidelity Electric Co., Lancaster, Pa., operating a cake mixer at 450 r.p.m.



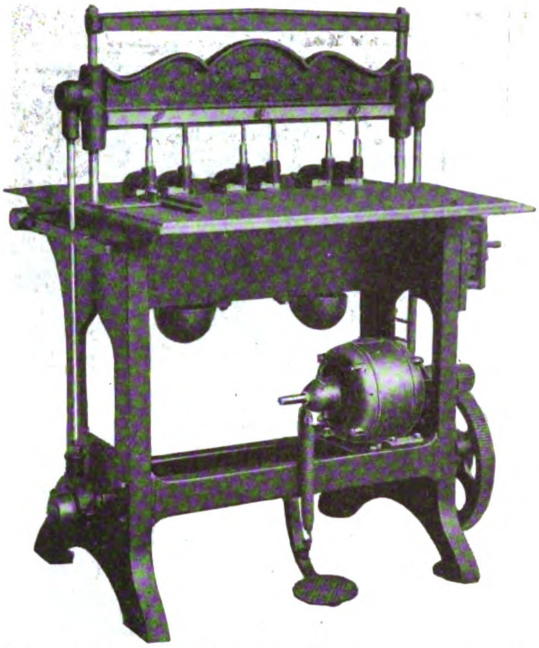
One horsepower, back geared, 1740 r.p.m., 3 phase, a.c. motor made by The Mechanical Appliance Co., Milwaukee, Wis., operating a bronzing machine mounted on casters.



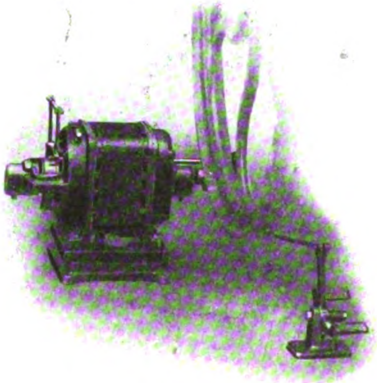
One horsepower, 1250 r.p.m., d.c. motor made by The Robbins & Myers Co., Springfield, Ohio, direct connected to wet and dry grinder made by Cincinnati Electrical Tool Co.



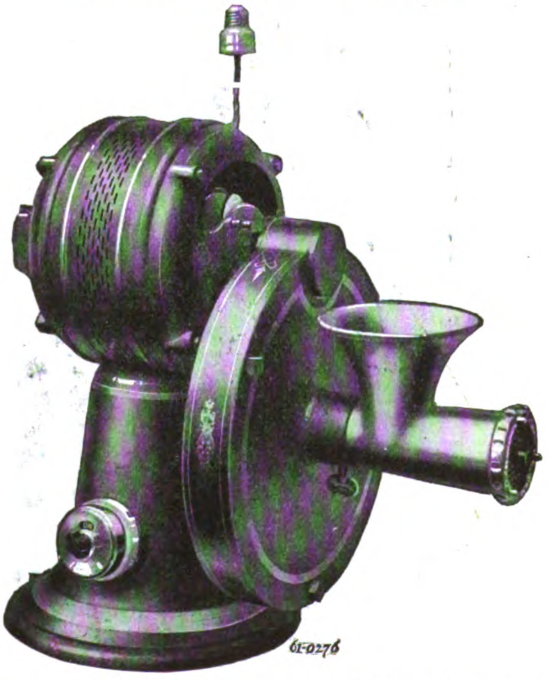
One horse power, 220 volt, 3 phase, 60 cycle, 1130 r.p.m., induction motor, made by Allis-Chalmers Mfg. Co., Milwaukee, Wis., geared to a mixer and blender in plant of Century Biscuit Co.



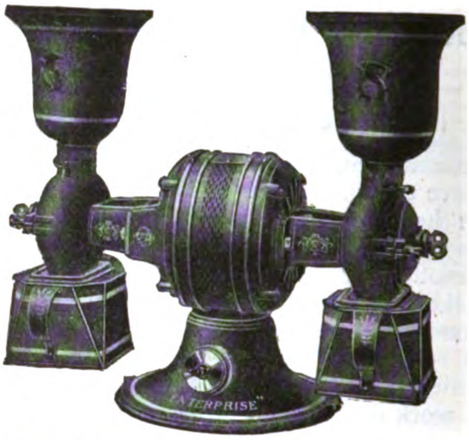
½ h.p., 900 r.p.m., constant speed, 220 volt, d.c. motor made by The Mechanical Appliance Co., Milwaukee, Wis., geared to a multiple paper punch.



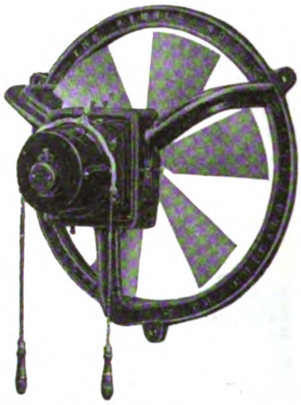
½ h.p. motor connected to printing press by placing small leather pulley against flywheel of press. Made by Kimble Electric Co., 634-646 North Western avenue, Chicago, Ill.



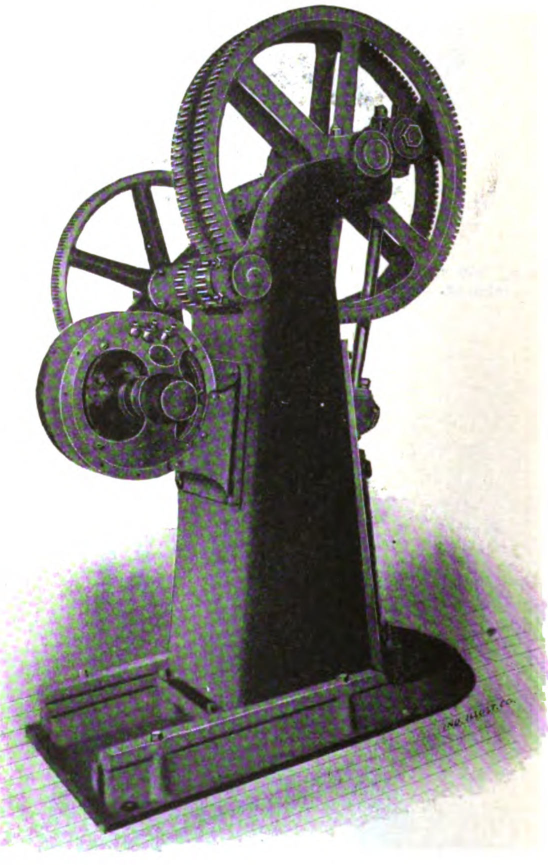
One horsepower polyphase motor, made by Wagner Electric Mfg. Co., 6400 Plymouth avenue, St. Louis, Mo., geared to a meat grinder suitable for the average sized butcher shop.



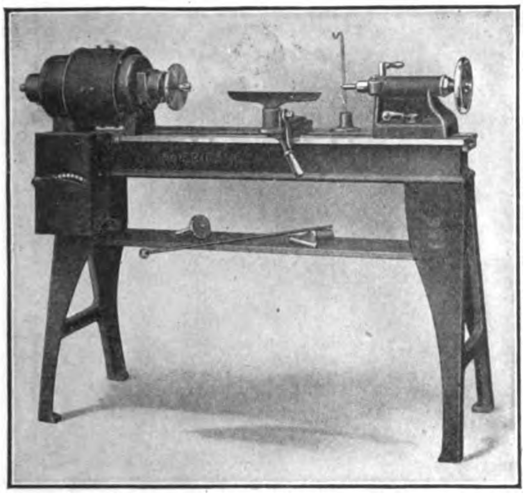
⅓ h.p., polyphase motor, made by Wagner Electric Mfg. Co., 6400 Plymouth avenue, St. Louis, Mo., driving a twin burr coffee mill.



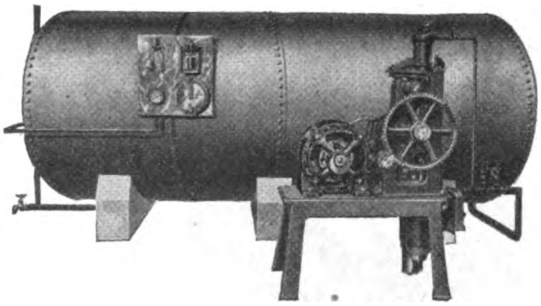
24-inch ventilating fan, operated by a ½ h.p. motor. Made by Kimble Electric Co., 634-646 North Western avenue, Chicago, Ill.



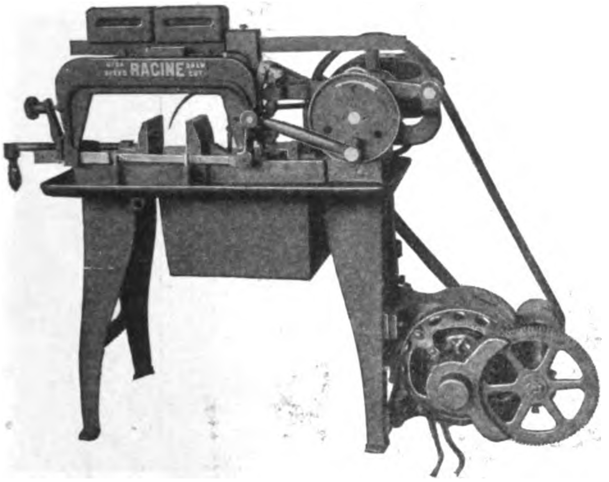
½ h.p. motor, made by American Rotary Valve Co., 156 N. Dearborn street, Chicago, Ill., geared to a deep well pump.



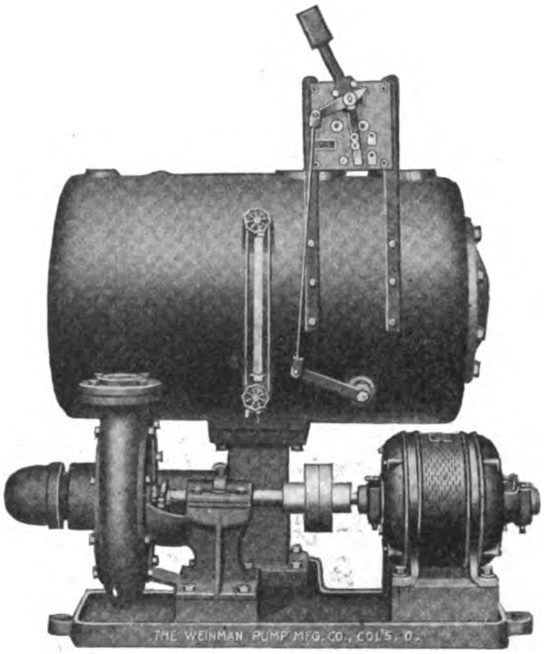
½ h.p., motor, made by Rochester Motors Co., Inc., Rochester, N. Y., operating a pattern maker's lathe.



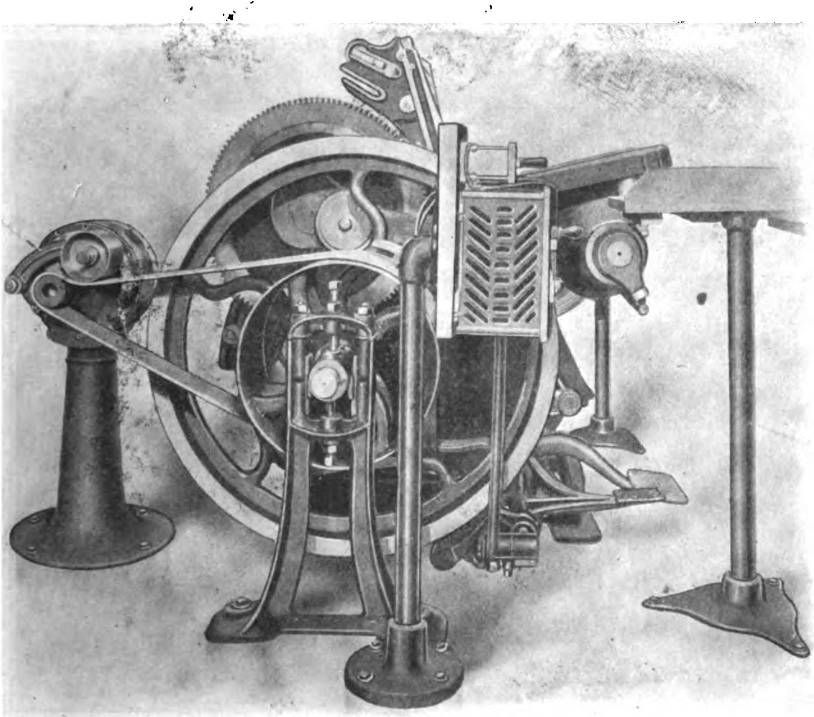
One horse power, 60 cycle, 1750 r.p.m., 104/208 volt, Century single phase motor, made by Century Electric Co., 19th, Pine to Olive streets, St. Louis, Mo., geared to a pump and air compressor for a house water system.



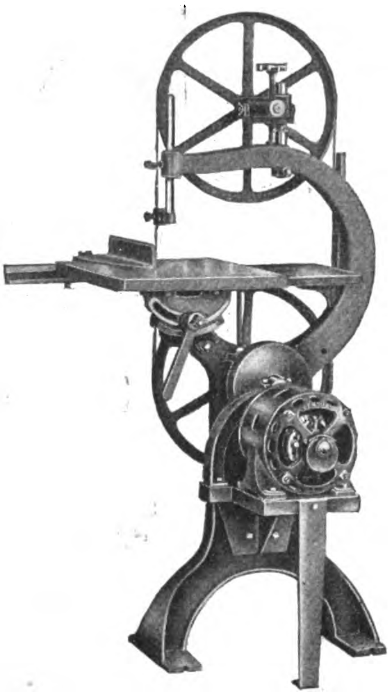
½ h.p., 60 cycle, 1750 r.p.m., 104/208 volt, Century single phase motor, made by Century Electric Co., 19th, Pine to Olive streets, St. Louis, Mo., belted to a hack saw, made by Racine Tool & Machine Co.



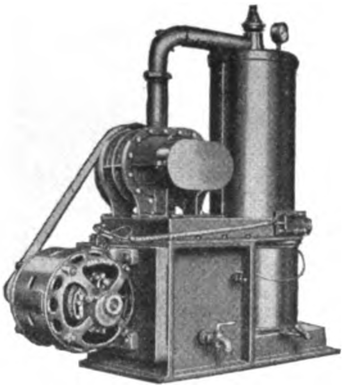
One horsepower polyphase motor, made by Wagner Electric Mfg. Co., 6400 Plymouth avenue, St. Louis, Mo., connected by flexible coupling to a pump automatically controlled by a float switch in the receiver tank.



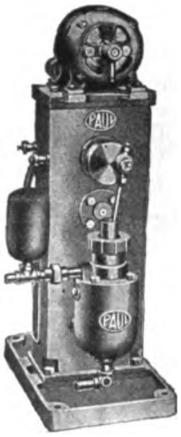
Job press, operated by motor, made by American Rotary Valve Co., 156 North Dearborn street, Chicago, Ill.; motor requirements ⅓ to 1⅓ horsepower according to size.



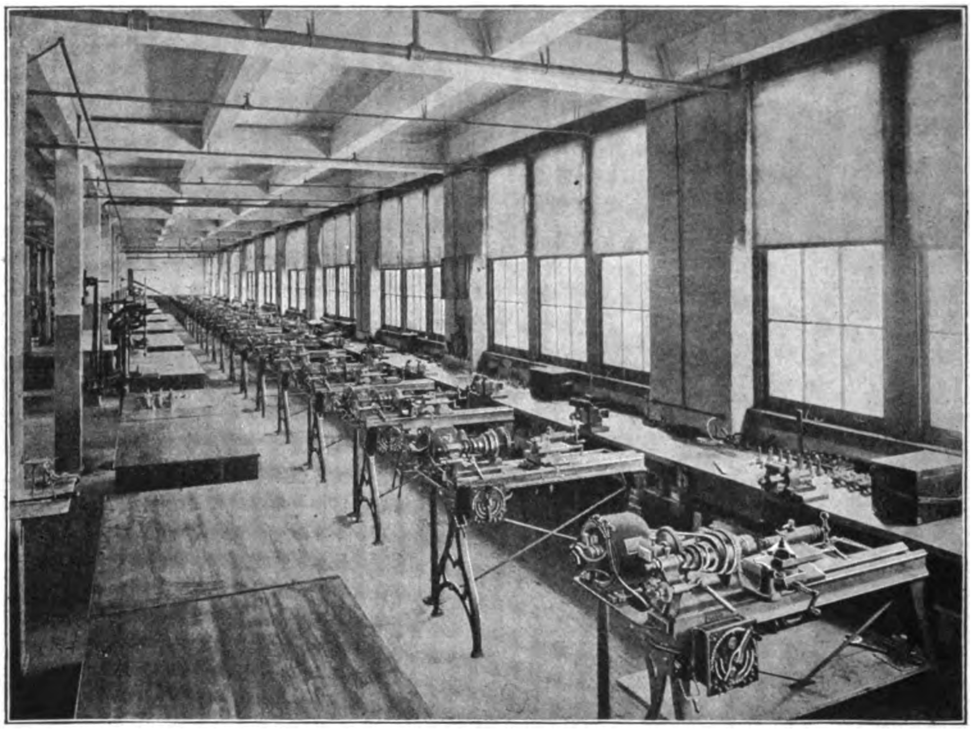
One horse power, 60 cycle, 1750 r.p.m., 104/208 volt, Century single phase motor, made by Century Electric Co., 19th, Pine to Olive streets, St. Louis, Mo., direct connected to a band saw, made by Crescent Machine Co.



One horse power 1165 r.p.m., 104/208 volt, 60 cycle, Century single phase motor, made by Century Electric Co., 19th, Pine to Olive streets, St. Louis, Mo., belted to a stationary vacuum cleaner, made by United Vacuum Appliance Co.

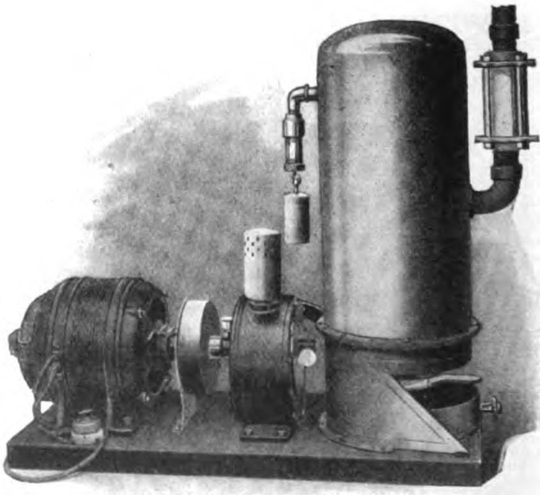


½ h.p., motor, made by Western Electric Co., 463 West street, New York, mounted on a type E Paul pump for shallow wells; capacity, 300 gal. per hour.

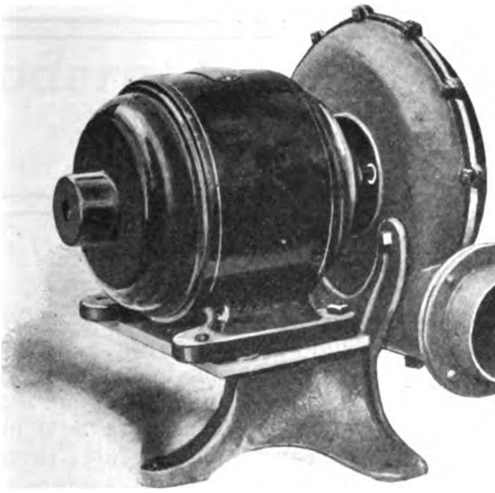


½ h.p., adjustable speed, 220 volt, reversible, direct current motors, made by Rochester Motors Co., Inc., Rochester, N. Y., driving lathes used for finishing range finders in plant of Bausch & Lomb Optical Co.

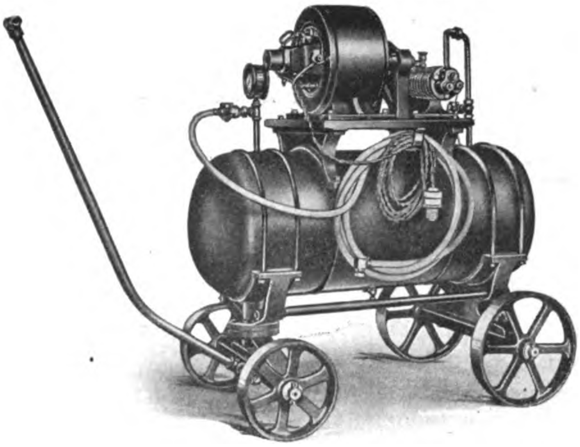
½ h.p., 600 r.p.m., 220 volt, d.c. motor with commutating poles for varying speed, made by The Mechanical Appliance Co., Milwaukee, Wis., belted to a drill press.



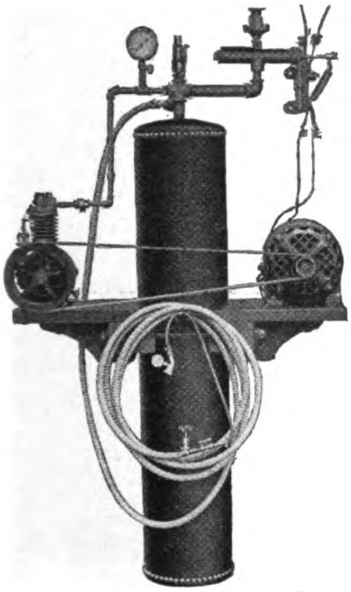
One h.p., polyphase motor, made by Wagner Electric Mfg. Co., 6400 Plymouth avenue, St. Louis, Mo., connected by flexible coupler to a stationary vacuum cleaner.



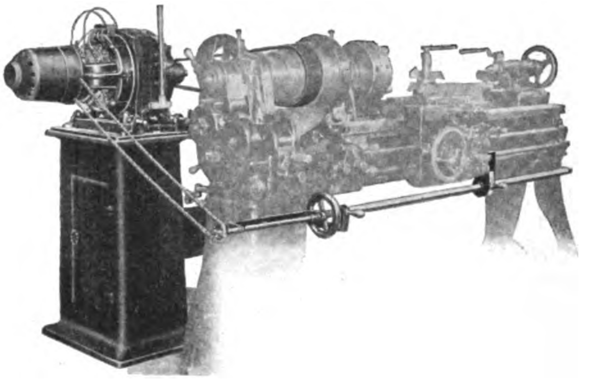
½ h.p., 220 volt, 1750 r.p.m. motor, made by the Fidelity Electric Co., Lancaster, Pa., direct connected to a blower.



½ h.p., 1600 r.p.m., d.c. motor made by The Robbins & Myers Co., Springfield, Ohio, operating portable air compressor outfit made by Brunner Mfg. Co.

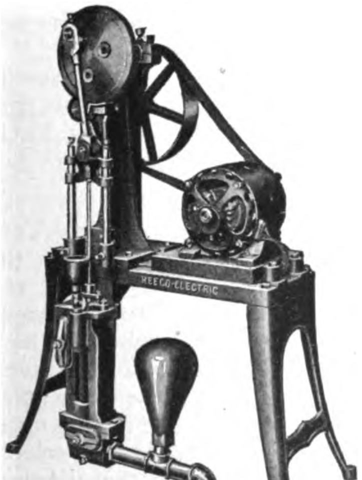


½ h.p., 60 cycle, 1750 r.p.m., Century single phase motor, made by Century Electric Co., 19th, Pine to Olive streets, St. Louis, Mo., belted to a garage air compressor, made by Rix Compressed Air & Drill Co.

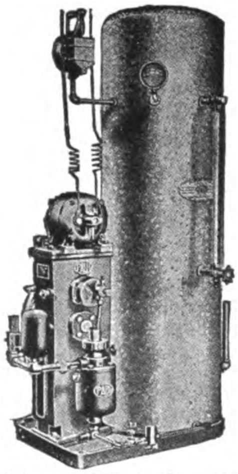


One horse power, single phase, adjustable speed motor made by Kimble Electric Co., 634-646 North Western avenue, Chicago, Ill., operating a lathe.

One horse power, 60 cycle, 1750 r.p.m., 104/208 volt, Century single phase motor, made by Century Electric Co., 19th, Pine to Olive streets, St. Louis, Mo., mounted on a drill press, made by Buffalo Forge Co.



One horse power, 60 cycle, 1750 r.p.m., 104/208 volt, Century single phase motor, made by Century Electric Co., 19th, Pine to Olive streets, St. Louis, Mo., belted to a single cylinder pump, made by Rider Ericcson Engine Co.



½ h.p., motor, made by Western Electric Co., 463 West street, New York, mounted on pump, forming part of a complete water system; capacity of pump, 300 gal. per hour at a pressure of 50 pounds.

CENTRAL STATION MISCELLANY

The New York Edison Co. has concluded to accept the order of the Public Service Commission for the First District and will revise its schedule of rates to go into effect as of May 1, 1915. In obedience to the order the company will reduce the present statutory maximum rate of 10 cents to a maximum rate of 8 cents per kilowatt-hour, without lamp renewals, for electric current for light and power purposes. Such reduction, together with the reduction due to a general revision of the rate schedule, will involve a reduction in the cost of service to practically all consumers of light and power, amounting to over one and three-quarter million dollars per year.

Consumers desiring to avail themselves of the lamp renewal facilities of the company may continue to obtain that service at a charge of ½ cent per kilowatt-hour for present standard lamps, or they may obtain these lamps from the company at the lowest wholesale prices.

These reductions are to apply to the territory of the New York Edison Co. with the exception of the comparatively sparsely settled section in the extreme northern part of the Borough of the Bronx, formerly contained in the town of Kingsbridge, and the territory east of the Bronx River, to which the company's service does not at present extend. The company makes this large reduction in the price for electric service, unprecedented in the electrical industry, in its desire to comply fully with the order of the Public Service Commission notwithstanding the continued falling off in its revenues at the present time, due to business depression, and the reduction in the current consumption, the result of the increasing use of improved, high efficiency lamps.

The representative committee of business and technical experts elected on March 9, by the manufacturers of electrical supplies and materials entering into electrical construction held a meeting in New York on March 23. At this meeting it was decided to make an exhaustive study of all kinds of electric wiring for buildings. It was also decided to determine the relative efficiencies of the several systems as regards safety to persons, protection against fire, and the method of wiring at low cost so as to insure popular approval. The results of the committee's efforts will be presented later in the form of concrete recommendations regarding standard systems, standard devices, and standard appliances. The following men were elected as a sub-committee to collect immediately all available data as to the advantages ad disadvantages of grounded return systems for building wiring. The committee is composed of the following men:

C. E. Corrigan, National Metal Molding Co.
W. H. Blood, Jr., National Electric Light Association.
G. S. Lawler, Associated Factory Mutual Fire Insurance.
J. R. Strong, Tucker Electrical Construction Co.
F. W. Glading, Bureau of Standards, Washington, D. C.
D. C. Jackson, Massachusetts Institute of Technology.

It is the opinion of this committee that the widespread effect of so radical a change in American wiring systems as would result from the complete adoption of the proposed grounded return system, gives force to the committee's decision to begin its investigations by thoroughly sifting the supposed theoretical advantages of that system, and so far as possible by obtaining authentic data of the results obtained in England and the Continent where the grounded returns have been used to some extent. Until the committee secures permanent headquarters, those interested in this subject are invited to address communications to the committee, care of LeRoy Clark, chairman, 114 Liberty street, New York.

A meeting of the Electrical Committee of the National Fire Protection Association was held at 123 William street, New York, on March 24-25. After some discussion and the adoption of some amendments of a minor character, the reports of the various sub-committees were adopted. These reports are printed in full in the pamphlet issued by the secretary of the Electrical Committee on February 15. More than ordinary interest was shown in the report of the committee, on switches and cutouts on the subject of refillable fuses. The concluding paragraph of the report of this committee, printed on page 7 of the pamphlet above referred to, was adopted by a standing vote. This paragraph reads as follows:

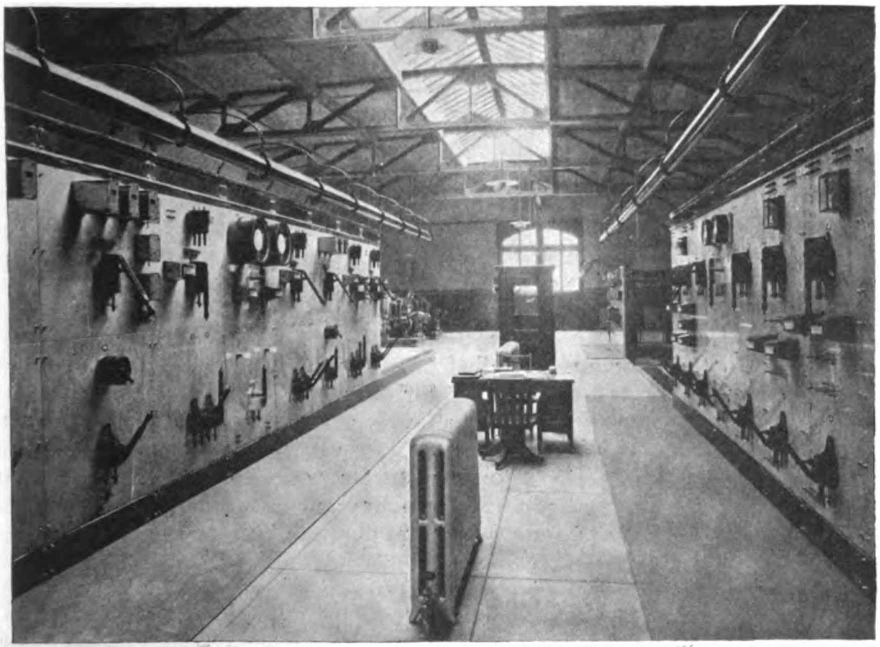
> It is the opinion of the committee that experience has not yet shown that fuses in which the fuse element is intended to be replaced or renewed by the user are satisfactory in test or in field service to a degree warranting the recognition of the principle of refillable fuses in the rules of the National Electrical Code.

There was considerable discussion on the subject of the proposed system of concentric wiring. This subject, however, remains now *status in quo*. Final action of the meeting resulted in the adoption of the first sentence of the report of the committee on grounded concentric wiring system as printed on page 12 of the secretary's pamphlet. This sentence reads: "The Committee reports progress and desires to be continued for further investigation of the subject." Those of our readers who wish to inform themselves in regard to the details of the report submitted by this committee are referred to page 54 of the ELECTRICAL RECORD for March, 1915, where the report is published in full.

Electric service consumers in New York will not only reap a small harvest of dollars from the reduction in rates by the New York Edison Co., referred to elsewhere on this page, but will save several million dollars worth of nickels yearly when the new flat rate telephone service changes become effective on July first. The matter of reducing these rates has been agitated for several years, but for one reason or another definite action has been postponed by the telephone company. The public will owe most of the nickels which it saves in this way after July first to the efforts of Max H. Winkler, who for the last two years has persistently kept at the company to give a five-cent local rate and abolish all tolls.

Modern Substations of the Boston Edison Co.

Architectural attractiveness, harmonizing with surrounding structures, is a marked feature of the substation buildings of the Edison Electric Illuminating Co. of Boston, Mass. Throughout the company's territory, which comprises over 700 square miles of eastern Massachusetts, about 40 substations are maintained. Of these, 5 have been constructed and equipped with new apparatus during the last two years. These stations are at Roslindale, South Framingham, Lexington, Chelsea, and Stuart street, Boston. The first four are alternating current stations, while the last named is in the direct-current distributing district of the Back Bay and South End. The Lexington station, in addition to equipment for supplying the lighting and power services of the district, is provided with rotary converters for street railway service to the Lexington and Boston division of the Middlesex & Boston Street Railway. It furnishes energy for operating cars formerly derived from a steam plant of the railway company at North Lexington.

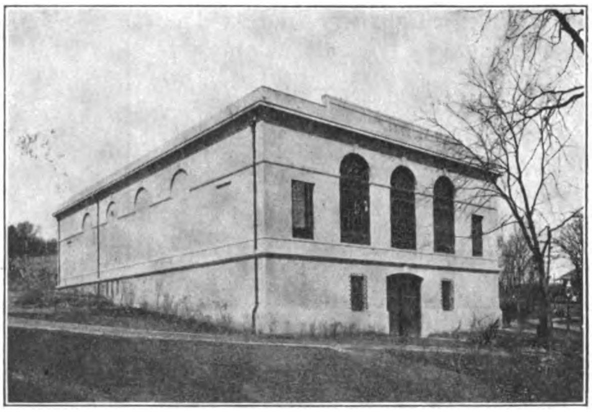

Interior view of Lexington substation. Boston Edison Illuminating Co.

While the several new substations have distinguishing features of design and equipment, the following general features are common to all, as regards their construction and arrangement: 1. Special precautions to insure safety to operators; 2. Use of fireproof materials throughout; 3. Adoption of concrete cell construction in the low-tension board similar to that used on the high-tension side, and its careful subdivision into compartments for the apparatus, furnishing ample protection by means of barriers and covers against the spread of an electrical disturbance; 4. General accessibility and greater spacing of apparatus; 5. Simple and direct wiring layout; 6. Introduction of "heavy duty" automatic switches in the permanent design of the high-tension board; 7. Transfer bus in the low-tension switchboard, not only facilitating the transfer of circuits when necessary, but eliminating the use of jumpers; 8. Adequate drains in regulator rooms to remove any oil that may be spilled during a serious accident; 9. Equipment of all rectifiers with latest "duplicate" tube tanks; 10. Use of a transfer bus in connection with the rectifier installations.

All the structures are fireproof, equipped with the most improved heating and ventilating systems, and provided with toilet facilities, shower baths and clothes lockers for operatives.

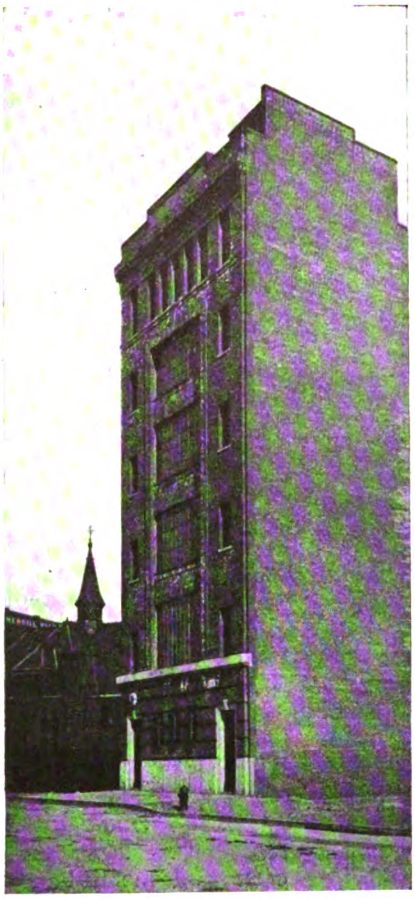
The Roslindale substation is located on South street, near Washington street, and serves that suburban district and half of Hyde Park. The building is a two-story structure of concrete, with "slap-dash" finish. The front is pierced with high arched windows which light the second, or main operating floor. Here are located the high-tension and low-tension switchboards and a group of 12 rectifier outfits. Station transformers are installed in an L adjoining, and here are also the 4000/2300-volt lightning arresters and the regulators on the distributing circuits. The ground floor contains 13,200-volt aluminum cell lightning arresters, but space is reserved for future installations of rotating machinery and an emergency battery.

The 13,200-volt high-tension switchboard is of reinforced concrete and metal lath and plaster, divided into cells and compartments containing the apparatus and wiring, and is arranged so as to confine any electric disturbance to a single circuit, thus insuring safety to operators.

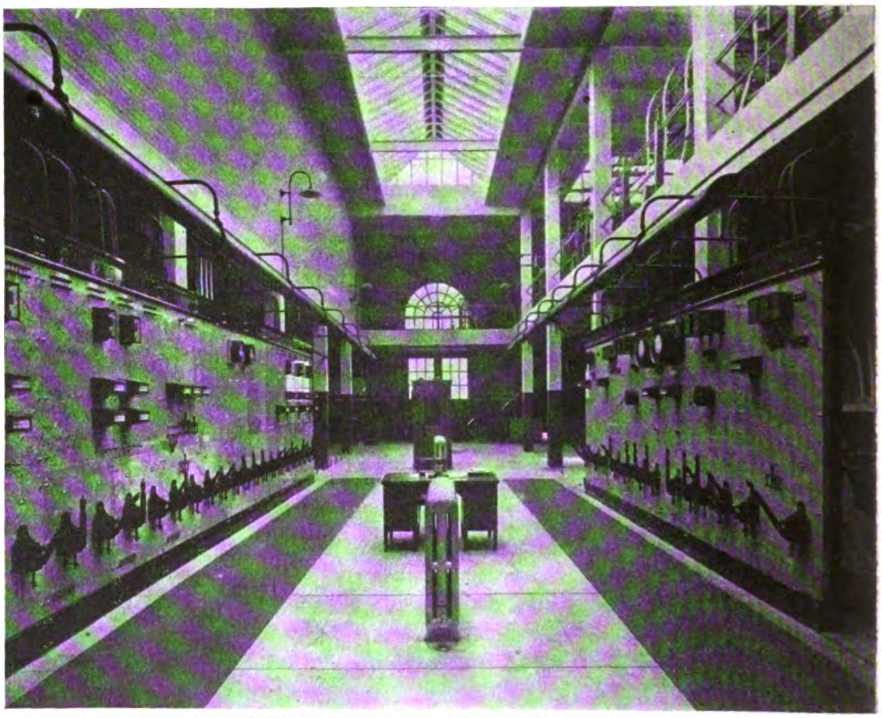

Berlindale substation. Boston Edison Illuminating Co.

The 4000/2300-volt low-tension switchboard is also a fireproof, concrete structure, subdivided by barriers into compartments for the apparatus. Bare buses pass from cell to cell through slots in marble slabs set in the concrete walls, with mica sleeves to prevent the contact of copper with the marble slabs which also form supports for stone barriers between a lower and an upper set of buses. A third bus, known as the transfer bus, is located on the rear wall, and each circuit may be connected to it by means of double-blade knife switches, without danger of interruption to service.

This bus eliminates the use of jumpers, and makes for flexible operation of the whole board.



Facade of Stuart street substation. Boston Edison Illuminating Co.



Interior view of Chelsea substation. Boston Edison Illuminating Co.

Westinghouse automatic regulators are installed on the distributing circuits, the case of each regulator being piped to a tank in the basement to draw off oil when necessary.

Two 750-kva. General Electric transformers, rated 3,200-4000/2300 volts, are located in the L. Energy is supplied on a three-wire, three-phase system and distributed by a four-wire, three-phase system. Under the transformers, the air chamber is partitioned off so that the three blowers, each of sufficient capacity to supply one transformer, may be used independently for either or for both units.

The rectifiers are of General Electric manufacture, each of 75-light capacity, and are operated from the 3,200-volt buses, a transfer bus being provided so that a circuit from a faulty tub may be transferred to any other rectifier outfit, and operated therefrom. Duplicate tub tanks are installed in connection with each.

The South Framingham substation is located about 20 miles from the South Boston generating station and serves a district comprising Framingham, Ashland, Hopkinton, Holliston, and a part or Sherborn. The building is of two stories, of brick construction, the upper story being reserved for a future battery. In the basement is the feeder regulator room.

On account of its fewer circuits, only three C. C. transformers are required instead of the extensive rectifier equipment in the Roslindale station. A small group of rectifiers and several motor generators or rotaries will, however, be installed later, it is planned.

The high-tension switchboard is similar to that at Roslindale except that the heavy-duty switches are Condit type DFA, the larger type F switch not being required at this distance from the generating station. The low-tension switchboard is practically identified with that of Roslindale, except that the regulators are located in the basement.

Two banks of General Electric transformers, consisting of three 500-kva. and three 200-kva. single-phase units, are located on the main operating floor, with air chambers in the basement. The blowers are located on the main floor.

The Lexington substation is located in the main street of that historic town, about 10 miles northwest of Boston, and serves the towns of Lexington, Bedford, and Carlisle. The building is a handsome stuccoed brick structure, with ample and well-laid grounds. The interior walls are lined with special brick and tile, which makes for economical upkeep and cleanliness. The building is divided into operating room, regulator room, and basement.

Low-tension and high-tension switchboards are of similar construction to those at Roslindale. In this station are installed two 750-kva., 60-cycle Westinghouse rotary converters for the street railway service referred to, and in connection is a railway switchboard consisting of two generator, one totality and seven feeder panels. The rotaries operate at 900 r.p.m. All connections between the transformers and the rotaries and from the latter to the panels are made in bare copper. Oil-cooled transformers now installed will probably be replaced later by large-capacity air-blast transformers.

The Stuart street station in Boston is a 6-story brick block, 40 x 120 feet in ground dimensions, and serves the district about Park square, relieving three stations serving this district heretofore.

In the basement are the feeder and transmission line ducts, and blowers for building ventilation and apparatus requiring individual artificial cooling. On the first floor are located an initial installation of two 1000-kw. motor generators, one being a two-unit and the other a three-unit set, and two 60-kw. Edison bipolar dynamos coupled for use as a balancer on the direct-current system. The ultimate capacity of equipment to be installed on this floor will be about 10,000 kw. in motor-generators and rotary converters.

The second floor is the main operating room and contains the 13,200-volt switchboard, a direct-current switchboard for distribution of 115/230-volt energy, aluminum-cell lightning arresters for protection against surges, and a bank of seven 75-light mercury arc rectifiers for street lighting. Room is available for additional rectifiers and extensions to the switchboards.

Like those installed in the Lexington and the Roslindale stations, the high-tension board is of reinforced concrete. The direct-current switchboard is of the usual Boston Edison type, there being two sets of positive and negative buses subdivided by means of knife switches so that five independent sections may be maintained. A pressure panel, on which are mounted a 100-point pressure wheel and instruments used as standards, forms the center of the board, which when completed will consist of 24 panels, with a total length of 75 feet and a capacity of 60 feeders, six motor-generators or rotaries and four 1250-kw. batteries, to be arranged on either side of the central panel.

On the third floor is a 1250-kw. Exide storage battery, consisting of 150 type H-69 elements having a capacity of 5100 amperes for one hour with a final pressure of 246 volts. Forty of the cells, 20 at either end of the series, are arranged for attachment as regulating cells in connection with four standard 13-point end-cell switches equipped with magnetically operated, remote-control mechanism. The battery is designed for emergency stand-by service and to float on the three-wire buses having a range of 115 to 132 volts on each side of the system. The fourth floor is for further battery installations, while the fifth and sixth floors are designed for business purposes.

The most recent construction is the Chelsea substation, which is perhaps the most approved station in Edison service. The building is a high, single-story brick structure with stucco finish, and is lighted entirely from the roof by means of Drouve anti-Pluvius monitors.

Ducts for the incoming lines and the distribution circuits are located in the basement, with air vaults and blowers for the station transformers, and a boiler for heating the building.

Above the operating room is a wide gallery running along the four sides of the building. The 6600-volt high-tension and the 4000/2300 volt, low-tension switchboards are located on opposite sides of the room, along the wall on the high-tension side being two 750-kw., three-phase air-cooled station transformers for converting 6600-volt energy to 4000/2300 volts for local distribution.

In the Chelsea substation both switchboards are of reinforced concrete, specially designed for safety, ease of operation, and flexibility. On the high-tension switchboard the buses are not placed one set above the other, but one set on each side of a vertical barrier. The buses are of bare copper tubing, mounted on high-tension insulators and entirely enclosed. Handholes are provided where it is desirable to obtain access to terminals or connections. The oil switches are mounted at the same level for each of the pairs, with handles on the instrument panels at a level. The passageways behind the boards are free from switch rods, bell cranks, and rods passing through and under the floor.

A gallery directly over the high-tension switchboard contains the lightning arresters, which are of the aluminum cell type, and instrument potential transformers and fuses.

The low-tension board, for 4000/2300-volt, four-wire, three-phase service, resembles the high-tension board as to the arrangement of buses, but between the oil switches and the buses are small disconnecting switches so that a faulty oil switch can be quickly disconnected and removed for repairs. A transfer bus, like that at Roslindale and Lexington, is installed on the rear wall.

Automatically operated induction regulators are located on the gallery above the switchboard. A separate room is partitioned off for this purpose, and drains are provided so that oil spilled from the regulators during accidents will be carried off quickly.

Here are installed also aluminum cell lightning arresters, service transformers for section lights and power, and potential transformers used in connection with the instruments and automatic equipment of the regulators. Most of the wiring is concealed, being carried through Orangeburg fibre and iron conduits built in the switchboard structure and in the floors.

On the gallery floor are also installed a bank of four 75-light rectifiers, which are operated from the 6600-volt board, and two 2300-volt C. C. transformers.

The Chelsea substation is said to be the last word in substation construction and equipment.

For the cuts used in illustrating this story we are indebted to *Edison Life*, published by the Edison Elec. Ill. Co. of Boston.

Last month the Bureau of Mines announced the discovery of two chemical processes, one of which, it is claimed, will be of tremendous importance to the oil industry, greatly increasing the supply of gasoline, while the other may make the United States absolutely independent of the rest of the world in regard to important materials necessary for the dye industry and the manufacture of high explosives used in warfare and in engineering operations. The first of these processes promises to enable refiners in this country to increase their output of gasoline from petroleum 200 per cent. or more. The second process includes the manufacture from crude petroleum of what is known chemically as toluol and benzol, both of which have heretofore been obtained from coal tar. As Germany has specialized far beyond other countries in by-products from coal, the United States and the rest of the world have been dominated by that country as regards those products of toluol and benzol which are the important bases for the production of dye stuffs and high explosives, and especially smokeless powder. The discoverer of these two valuable processes is Dr. Walter F. Rittman, chemical engineer of the Bureau of Mines.

The Fort Wayne Miniature Lamp Co. has discontinued the manufacture of lamps, the plant being taken over by The A. C. Mannweiler Co., 2719 Broadway, Fort Wayne, Ind.

TECHNICAL SCIENTIFIC — FINDINGS — PHILOSOPHICAL THEORETICAL

There are five different ways of converting alternating current into direct current, all of which are now in practical operation. The five methods are:

1—By the rectifying commutator.
2—By the aluminum valve rectifier.
3—By the mercury vapor rectifier.
4—By the rotary converter.
5—By the motor-generator.

The method used for making the conversion depends upon local operating conditions.

The normal eye sees all colors, but about 4 per cent. of all individuals are color-blind and lack the power to distinguish color in certain parts of the spectrum, generally the red end. In rare cases no color sensation exists at all, all objects appearing white or gray in tone.

It is reported that General Joffre of the French army regulates all the movements of a 200-mile line of battle by telephone.

That longleaf pine treated by the sulphate process and properly handled will give excellent kraft pulps and papers, especially the very strong and very tough, lightweight brown wrapping papers, is the conclusion reached by the Department of Agriculture after a series of tests to determine the wood's possibilities as a source of pulp. This conclusion is of significance at this time, because war has cut off the German supply to this country. The high specific gravity of the wood and the resultant high yield of pulp per cord, says the department in a recently issued bulletin, give longleaf pine an advantage possessed by few other commercially important woods suitable for pulp making.

The Victoria Falls of the Zambesi, in South Central Africa, are capable of furnishing 35,000,000 horsepower of electrical energy, and probably not over from 5,000,000 to 30,000,000 horsepower from the direct or indirect use of oil or coal is employed in the world to-day.

For surface propulsion of a self-sustaining submarine, the internal combustion engine has been commonly adopted. At first gasoline appeared to be the ideal fuel, but because it vaporizes rapidly and readily under ordinary conditions and because in the enclosed space of the submarine the vapor from any gasoline which might chance to escape would vitiate the atmosphere and may form explosive mixtures, its presence in vessels of this type is an element of danger. While precautions in the design may eliminate this risk to a large extent when the conditions are normal, it is impossible to provide against the damage to the structure or fittings by collision or other accident which may result in the release of some or all of the fuel, with disastrous results. This danger not only applies to the submarines but also to their tenders and stations supplying fuel. In consequence gasoline has generally been abandoned for this service. The ideal fuel for submarine boats is one not having inflammable vapors at atmospheric pressures and at the temperatures existing in the boat; it is one that can be safely handled, has high heat value per unit of weight and is suitable for use in internal combustion engines. Kerosene fulfils these conditions and can be used with the Otto cycle if heated before or upon admission to the cylinder. This heating can be readily and automatically performed after the engine is once warmed up, but the difficulty in starting the cold engine must be overcome.

The United States Geographical Survey reports that the copper produced in the United States in 1914 showed a marked decrease from that produced in 1913. In 1913 the country produced about 1,615,000,000 lb.; in 1914 the output was 1,493,000,000 lb.

Sound travels at the rate of:

1,090 feet a second in air.
4,190 feet a second in hydrogen.
4,730 feet a second in water.
12,200 feet a second in copper.
15,700 feet a second in iron.

Sound is increased in intensity when the sonorous body is in the neighborhood of another body capable of vibrating in unison with it.

In wireless telegraphy the functions of the transmitting condenser are, by virtue of its capacity, to store the charge delivered to it by the transformer secondary circuit until its potential reaches the desired value as determined by the spark gap, and then to discharge through the gap and the inductance.

Induction coils are no longer used to any extent in X-Ray work. The step-up transformer, in connection with the rotary rectifier, is now used to change high-tension alternating current into high-tension direct current.

The compound of cellulose and nitrogen, discovered by Schonbein in 1845, is known as nitrocellulose or gun cotton. It is made by treating cotton with a mixture of nitric and sulphuric acids. The product varies according to the amount of nitrogen introduced. The higher nitrates are powerful explosives, among them being cordite and ballistite. The lower nitrates combined with camphor under heat form celluloid. Dissolved in amyl acetate they form lacquers and aluminum paint. Cloth, when impregnated with this solution and calendered, becomes imitation leather. When subjected to the Chardonnet nitrating process, ordinary cotton takes on the lustre and feel of pure silk.

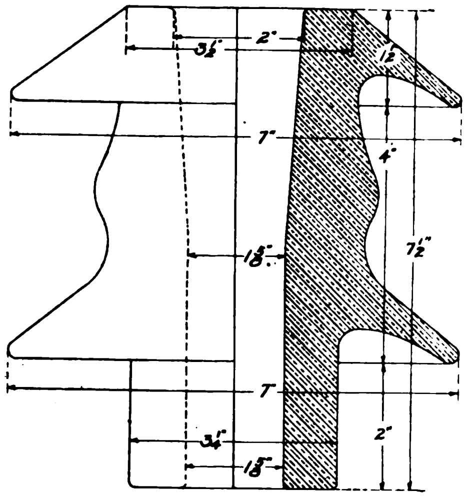
High Tension Materials and Fittings

(HIGH TENSION SERIES—ARTICLE NO. 3)

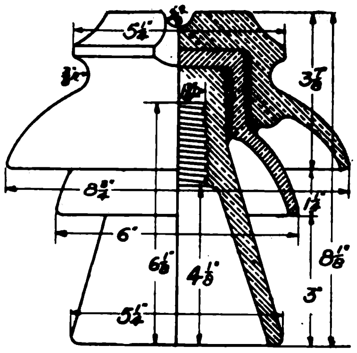
In the two preceding articles of this series a number of line materials such as potheads, cable bells, and terminals, were illustrated, as were also insulators, and a number of protective devices, including disconnecting switches, choke coils, fuses, lightning arresters, and horn gaps. The line materials and protective devices were not described at length as their uses are self-evident. As previously mentioned, insulators are of three types, pin, suspension, and strain. A number of the different kinds of insulators for high tension service were illustrated in the article appearing in the March issue, additional insulators are shown in this article.

In addition to the materials and fittings that have been illustrated, there is a large variety of fittings used in high tension work, designated as pole line hardware. This includes malleable iron brackets, arms, and pins, in a large number of shapes and styles. A number of these fittings are illustrated in this article. In the article to appear in the April number, these will be described at greater length, additional types will be shown, and a number of illustrations of poles and towers will also be included. The wire used will not be described or illustrated. In a future article, one of a series of Common Materials articles, the subject of wire will be considered in some detail.

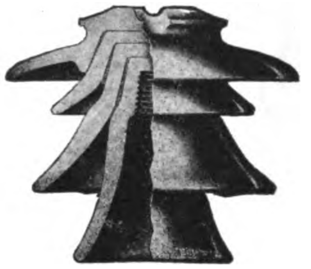
6,600 volt, pin type, porcelain insulator; dry test voltage 50,000, rain test voltage 28,000; leakage distance 6½ inches, striking distance 1⅛ inch. Made by The Pittsburg High Voltage Insulator Co., Derry, Pa.



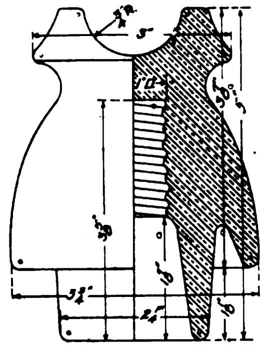
15,000 volt, porcelain, strain insulator; dry test voltage 50,000, rain test voltage 30,000; leakage distance 6½ inches, arcing distance 2¾ inches. Made by The R. Thomas & Sons Co., East Liverpool, Ohio.



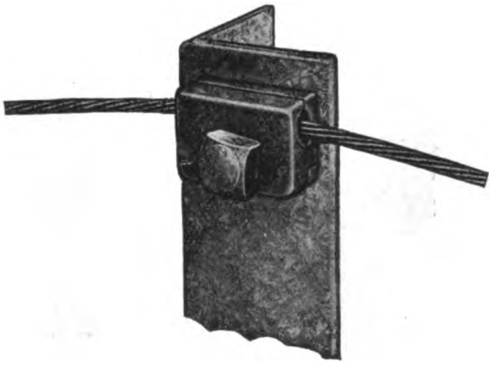
33,000 volt, pin type, porcelain insulator; dry test voltage 90,000, rain test voltage 65,000; leakage distance 20 inches, arcing distance 4¾ inches; size of pin hole, 1⅛ inches. Made by The R. Thomas & Sons Co., East Liverpool, Ohio.



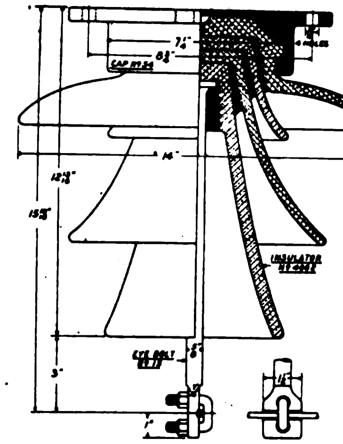
70,000 volt pin type porcelain insulator; dry test voltage 175,000, rain test voltage 15,000; leakage distance 40½ in., striking distance 10 in., size of pin hole 1⅜ inch. Made by The Pittsburg High Voltage Insulator Co., Derry, Pa.



10,000 volt, pin type, porcelain insulator for cable; dry, test voltage 35,000, rain test voltage 22,000; leakage distance 7 inches; arcing distance 1¼ inch. Made by The R. Thomas & Sons Co., East Liverpool, Ohio.

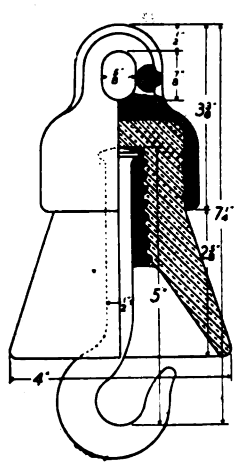


Bayonet type ground wire clamp for clamping the strand or cable so as to hold it away from sharp edges of steel angle; for ¼ or 5/16 inch strand. Electric Service Supplies Co., 17th and Cambria streets, Philadelphia, Pa.

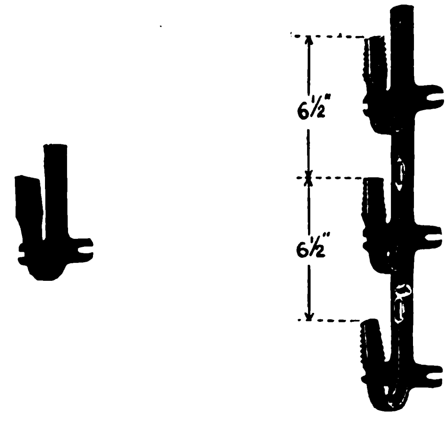


60,000 volt, pin type, porcelain insulator; dry test voltage 150,000, rain test voltage 110,000. leakage distance 42 inches, arcing distance 9½ inches, size of pin hole 1¾ inches. Made by The R. Thomas & Sons Co., East Liverpool, Ohio.

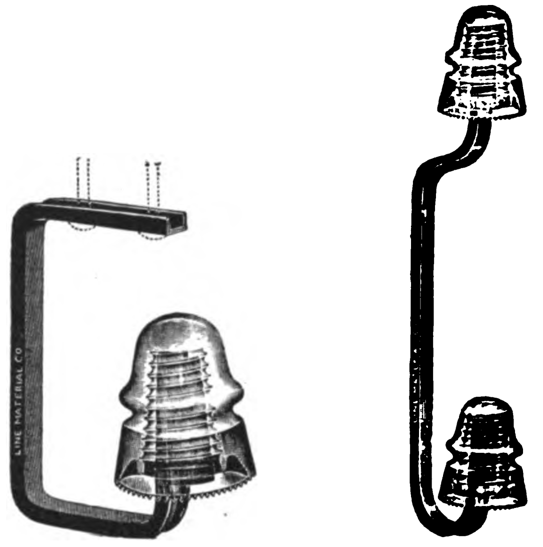
Two types of insulator pins for mounting on pipe, of malleable iron with cement tops. Made by General Devices & Fittings Co., 817-825 West Washington boulevard, Chicago, Ill.



Single unit, suspension type, porcelain insulator; dry test voltage 35,000, rain test voltage 23,000; leakage distance 5 inches, arcing distance 1 inch. Made by the R. Thomas & Sons Co., East Liverpool, Ohio.



One and three insulator, vertical type, one piece brackets; with split heads and felt insertion; japanned or galvanized. Made by Line Material Co., South Milwaukee, Wis.



One and two insulator channel brackets with patented clip; japanned or galvanized. Made by Line Material Co., South Milwaukee, Wis.

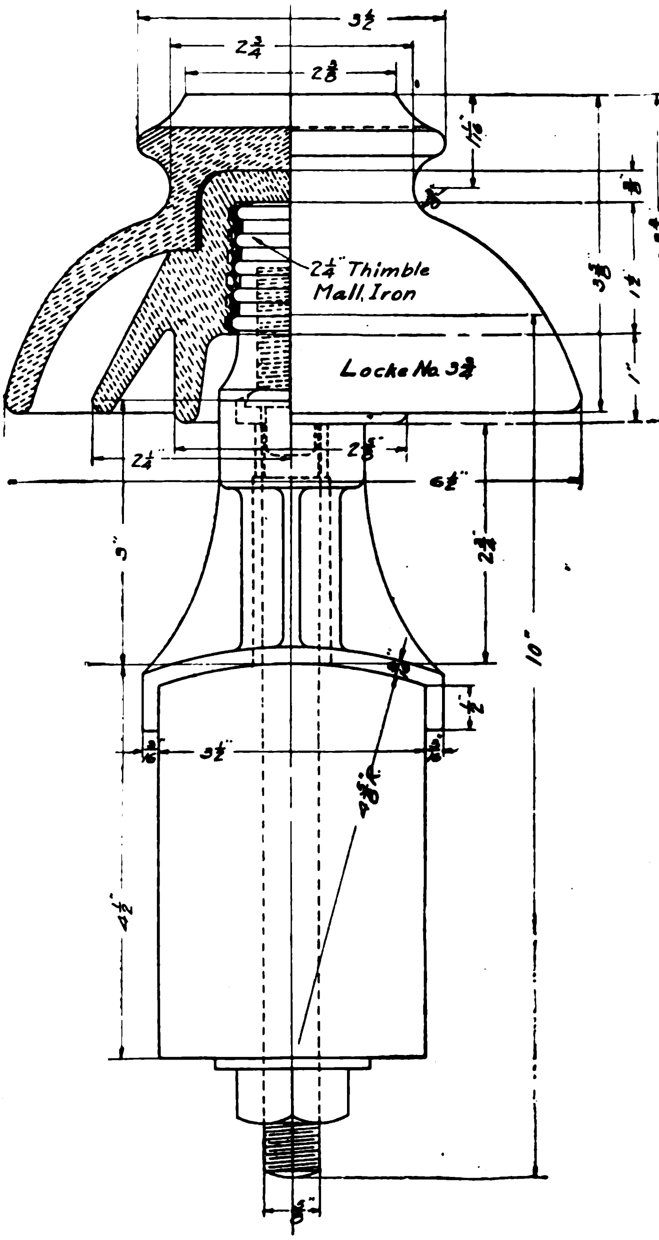
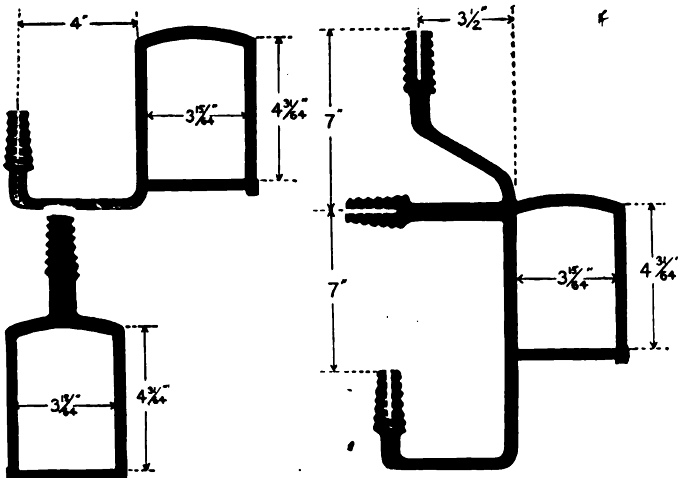
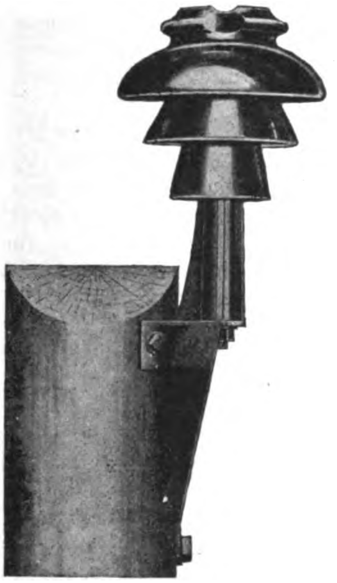


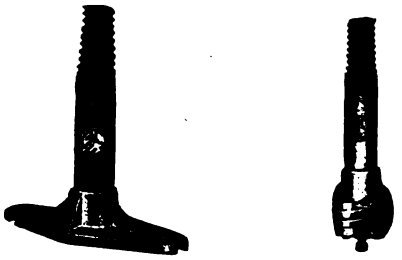
Diagram showing typical assembly for voltages up to 23,000, using 3½ by 4½ inch section, rounded top wood cross arm, truss pin with thimble, and insulator. Electric Service Supplies Co., 17th and Cambria streets, Philadelphia, Pa.



Three types of boltless clamp brackets; japanned or galvanized. Made by Line Material Co., South Milwaukee, Wis.



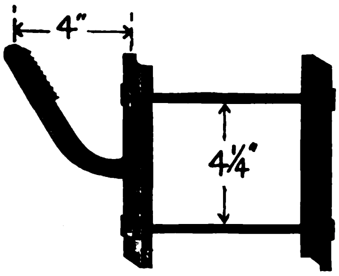
Pole top type, truss pin (with insulator) designed for attachment to the top of a pole with bolts or lags; has interchangeable thimble to secure uniform construction where pole top pins are used in conjunction with cross arm types. Electric Service Supplies Co., 17th and Cambria streets, Philadelphia, Pa.



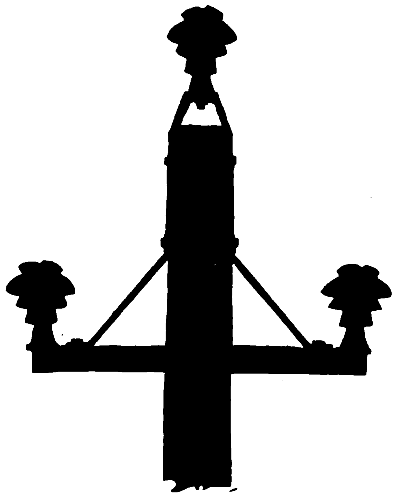
For flat surfaces.

For pipe, with full clamp bottom

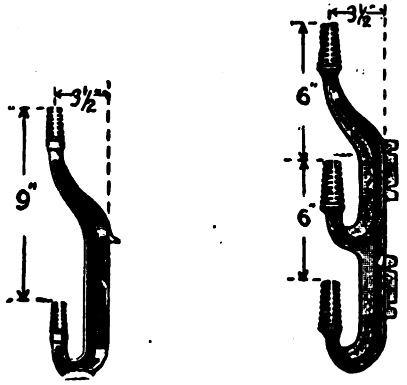
Two types of insulator pins of malleable iron with wood tops. Made by General Devices & Fittings Co., 817-825 West Washington boulevard, Chicago, Ill.



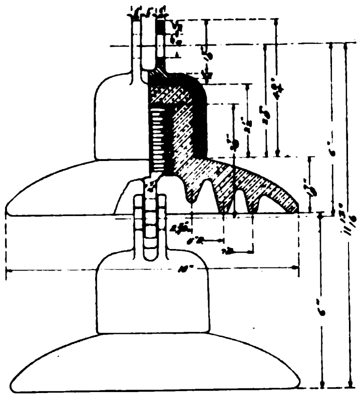
Malleable iron one piece bracket, with patented clip for insulator; japanned or galvanized. Made by Line Material Co., South Milwaukee, Wis.



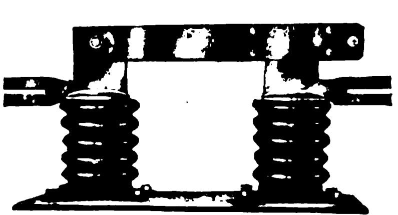
Showing triangle arm, truss pins, and insulators assembled on pole; arm consists of a horizontal member of steel angle section, and one member of flat steel formed and assembled by means of two bolts; in three sizes for voltages of from 30,000 to 50,000. Electric Service Supplies Co., 17th and Cambria streets, Philadelphia, Pa.



Two and three insulator, spreader brackets; in grey iron, malleable iron, and malleable iron with felt insertion; japanned or galvanized. Made by Line Material Co., South Milwaukee, Wis.



Single unit suspension type, porcelain insulator; dry test voltage 80,000, rain test voltage 50,000; leakage distance 12 inches, arcing distance 3¼ inches. Made by The R. Thomas & Sons Co., East Liverpool, Ohio.



1,000 ampere, 13,200 volt, single pole, single throw, disconnecting switch without locking device, mounted on flat steel base with post insulators. Made by Electrical Engineers Equipment Co., 711-715 West Meridian street, Chicago, Ill.

COMMON MATERIALS

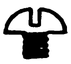
SUCH AS ARE USED IN MANUFACTURING AND INSTALLING SPECIAL DEVICES. ALL NEW PRODUCTS ARE SHOWN IN THE DEPARTMENT SO NAMED.

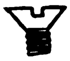
No. 34---Machine Screws

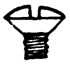
Considered broadly, there are three classes of screws; wood screws, machine screws, and a class of miscellaneous screws, which includes, cap, set, and thumb screws.

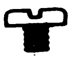
Wood screws are made for use in wood and are designed so as to thread their own way in the material into which they are to be inserted. Machine screws are for use in metal; they never cut their own way, the metal which they penetrate always being tapped for entering and holding purposes. A machine screw may have a point—and sometimes does, usually a 45-degree point—but the point is never employed for starting the screw. The distinction generally made is that a wood screw is for use in wood and a machine screw for use in metal. The miscellaneous class is too varied to permit of a definite description. They are not used for any electrical purposes. Wood screws have no electrical uses. This article therefore is confined to a treatise on machine screws.

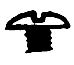
Machine screws are made by two processes, and the product of these processes are called. "automatic cut thread screws" and "roll thread screws." Automatic cut thread screws are in reality screw machine products, cost more than roll thread screws, and as a result of this higher cost, are very little used by the electrical trade.

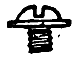

Round head.

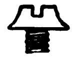

Flat head.

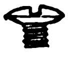

French head.

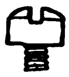

Straight sides. Binding.


Curved sides. Binding.


Washer head.


Cockscrew head.


Fillister head.


Lentil head.

ROLL THREAD MACHINE SCREWS

Roll thread machine screws are made from iron, steel, brass, and copper wire, and even bronze when required. The process of manufacture is as follows:

The wire is cut into a suitable length, after which a head is formed by what is called a heading-up process. A slot is next cut in the head. The final process consists of rolling the screw between two dies, by which method the thread of the screw is rolled in, hence the name, roll thread screws.

A large number of kinds of roll thread machine screws are used for electrical purposes. Some are considered as standard, the rest as special screws. Standard roll thread machine screws are named according to the kind of head employed, as follows: round head, flat head, fillister head, French head, binding head straight sides, binding head curved sides, washer head, lentil head, and cock screw head.

Round head, flat head, and fillister head screws have no special uses, but are employed for a large variety of purposes. The principal uses for the other kinds of screws in the electrical trade are: French head, for flush switch and wall receptacle plates; binding head straight sides and binding head curved sides, for wiring devices and general wiring work where it is necessary to compress a wire between the screw and a terminal; washer head, for snap and knife switches; lentil head, for snap switches, principally for centre contacts; cock screw head, for gas fixtures almost entirely.

A prominent manufacturer of sockets when running his factory on full time uses a million and a quarter machine screws a day.

Machine screws are generally ordered by number, the number being indicative of the gage. The gage employed is known as American Screw Gage, and the numbers usually called for by the electrical trade run from No. 2 to No. 20. In addition, the following information is usually necessary: kind of head, length of screw, and number of threads to the inch.

In order to give a definite idea as to what the different kinds of roll thread machine screws used by the electrical trade look like, a number of line drawings showing the different styles of head, are included. For the names of the manufacturers of machine screws consult the Classified Index appearing regularly in every number of the ELECTRICAL RECORD, under the heading of Screws, Machine.

Report of the A. T. & T. Co. for 1914

The report of the directors of the American Telephone & Telegraph Co. for the year 1914 has just been issued by the directors of that company. This report shows that under the direction of the engineering staff, plant of all kinds costing more than $425,000,000 was added to the Bell system in five years, and plant to the value of more than $175,000,000 was taken out and removed from service.

The net earnings of the company for the year were $40,557,977.29, approximately the same as in the previous year. The interest charges were $8,223,163,23 and the dividends at the regular rate of 8 per cent. per annum were $27,572,674.72. Of the resulting balance there was carried to reserves $2,500,000 and to surplus $2,262,139.34.

An analysis of the finances of the company shows that it takes an investment of nearly $4 to earn $1 in gross revenue. This dollar of gross revenue is divided; 46½ cents are paid in wages to employees, 5½ cents go for taxes, and 24 cents go for material and other expenses a very considerable part of which ultimately goes for wages. This leaves a net operating revenue of 24 cents, of which about 20 cents pays for the use of the $4 capital invested. The remaining 4 cents of surplus revenue are actually expended for plant additions of which about one-half is for wages.

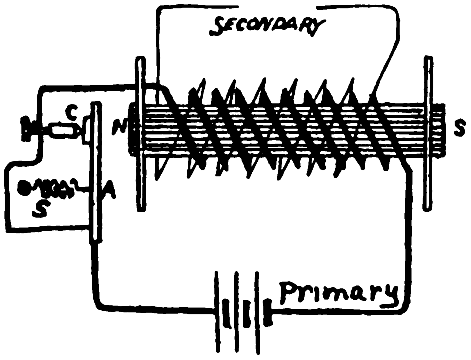
One of the year's developments was an underground cable which in its diameter of 2⅝ inches carries 2,400 telephone wires.

SPECIAL DEVICES

SHOWING ALL TYPES WITHOUT REGARD TO TIME THEY HAVE BEEN ON THE MARKET. ALL NEW PRODUCTS ARE SHOWN IN DEPARTMENT SO NAMED.

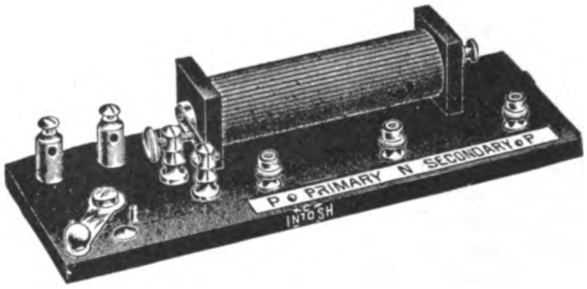
No. 28---Induction Coils

There are a large number of devices classed as "coils," each serving a different purpose and acting upon a different principle. This article is confined to a description of that class of coil known generally as an induction coil. By some, induction coils are often referred to as transformers, or transformer coils. Fundamentally, a transformer is an induction coil, of the closed core type; that is, the transformer has a magnetic circuit completed through iron and operates on alternating current, while the circuit of an induction coil is completed largely through air, and the induction coil operates on direct currrent, producing alternating current in the secondary windings. Transformers are now being made, however, with open cores, and are called open core transformers. These are being largely used now instead of induction coils for medical purposes, and are made in two styles, one to operate on direct current, the other on alternating current. Their chief advantage is the fact that in action they are self-interrupting, requiring no mechanically or magnetically operated interrupter or circuit breaking device.



Sectional cut of induction coil. NS is core composed of soft iron wires. S is mechanical spring for pulling back armature A to contact point C after armature is released from contact with N when current through primary is broken.

An induction coil consists essentially of a sleeve or tube, a core made up of a bundle of stranded soft iron wires, a primary coil, a secondary coil, and a device for making and breaking the primary circuit. The primary and secondary coils are wound over the sleeve containing the soft iron core. Sometimes the primary and secondary coils are placed side by side; sometimes they are wound concentrically. The circuit breaker, as its name implies, automatically interrupts the currrent set up in the primary by the source of electrical energy. Stripped of technicalities, the operation of the induction coil may be said to be due to continuous interrupting of the primary circuit, the rapid make and break affecting the secondary circuit inductively. This inductive effect of the primary on the secondary is in direct proportion to the relative number of turns in these two coils, the nature and shape of the magnetic path, and the frequency of interruption. The primary coil consists of a few turns of coarse wire, the secondary of a large number of turns of fine wire. Either or both coils may consist of one large coil or a group of smaller coils. In the latter case several combinations of primary and secondary voltages can be obtained by varying the total number of turns impressed into service. The result is usually that the secondary pressure or voltage is always largely in excess of that of the primary. Ample insulation between the coils and the core and the coils themselves is provided so as to prevent possible breakdown and short circuit due to the excessively high pressures in the secondary. By proper calculation and design, makers of induction coils can produce coils with any combination of primary and secondary voltages. The core over which these coils are wound is composed of soft iron wires so as to afford a path of low resistance for the magnetic circuit set up by the currents flowing in the coils. The presence of this soft iron core greatly increases the range and efficiency of the induction coil. This effect is readily observed in so-called medical coils, the amount of shock being regulated by sliding the soft iron core in and out of the instrument. Medical coils give a lower secondary voltage or pressure than ordinary induction coils. The interrupting device connected with the primary coil is equipped with platinum, tungsten, or other hard metal contact points. A hard metal must be used for these contact points as the sparking due to the break in the primary circuit would quickly destroy ordinary metals. A special form of induction coil formerly known as a spark coil is now called a "kick coil." It is wound with a large number of turns of coarse wire and does not employ a secondary or a circuit breaker. This coil is used for igniting gas jets in places where illuminating gas is used. Another special type of induction coil has been developed by Tesla, for use in telephone work. Unlike the ordinary induction coil, the Tesla coil has no iron core.



Typical induction coil mounted on block and provided with binding posts and switch. When connected with a liquid or dry cell it constitutes a complete medical battery. Made by McIntosh Battery & Optical Co., 322 West Washington street, Chicago, Ill.

Induction coils are often called Ruhmkorff coils, being named after their inventor. At this point it might not be out of place to remark that the Ruhmkorff or induction coil is based on the open core, or open magnetic circuit, principle. The coil discovered and invented by Faraday, on the contrary, is based on the closed core, or closed magnetic circuit principle. The original Ruhmkorff coil is the parent of all the induction and spark coils in use to-day. The original Faraday coil is the parent of all the transformers used in light and power work to-day.

USES FOR INDUCTION COILS

The induction coil was one of the very early electrical devices to come on the market, and it has been used in great variety for a number of different purposes. The purposes for which it is used now are relatively few compared with former applications. It has been superseded for some purposes by more modern and more efficient apparatus. For instance, some manufacturers have abandoned using it in connection with electrotherapeutical apparatus. Here it has been superseded by a step-up transformer in combination with a rotary rectifier. Induction coils are, however, still used extensively in laboratories. A number of fundamental and interesting physical and chemical experiments can be conducted by means of this apparatus, experiments which are not possible with any of the apparatus that has displaced the induction coil for commercial purposes. There is no fundamental difference between an induction coil and the spark coil used for gas engine ignition. The motorists have corrupted the term so that the old time induction coil is now generally called a "spark coil." When an induction coil is used in connection with medical apparatus it is called a medical coil; when used for gas engine ignition purposes it is called a spark coil. Under the name of spark coils more induction coils are being manufactured and used to-day than ever before, millions of them being manufactured yearly for ignition purposes in automobiles, motor boats, flying machines, motorcycles, submarines, and isolated lighting plants. Aside from these uses, induction coils are consumed in large quantities by the concerns manufacturing the following apparatus:

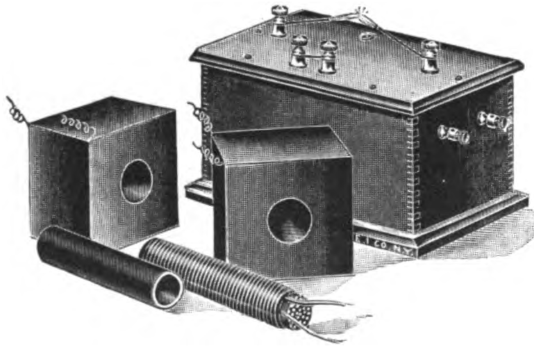
Medical batteries—Medical batteries, for home treatment, consist generally of batteries and an induction coil.

Wireless telegraphy—Every wireless station, whether commercial or amateur, is equipped with induction coils.

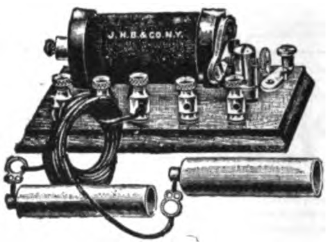
Telephones — Every telephone circuit must be equipped with at least one induction coil.

X-Ray and electrotherapeutical work—Induction coils have been, and are still used, to a large extent in connection with X-Ray and electrotherapeutical apparatus. As already noted, however, the use of the induction coil in this respect has been largely superseded by other apparatus.

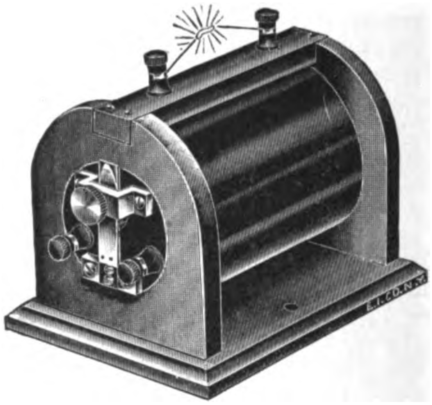
For the manufacturers of induction coils see the Classified Index appearing in every number of the Electrical Record under the heading of Coils, Induction.



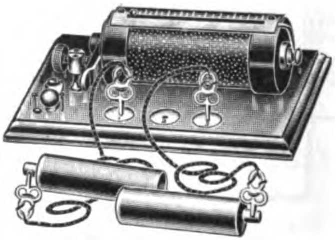
Transformer-coil for wireless work (open core type); in reality a spark coil on a large scale. This coil is not sealed in the box, and can be taken apart. No vibrator or condenser is furnished and the coil must be used with an interrupter on 110 volts alternating or direct current. Electro Importing Co., 223 Fulton street, New York.



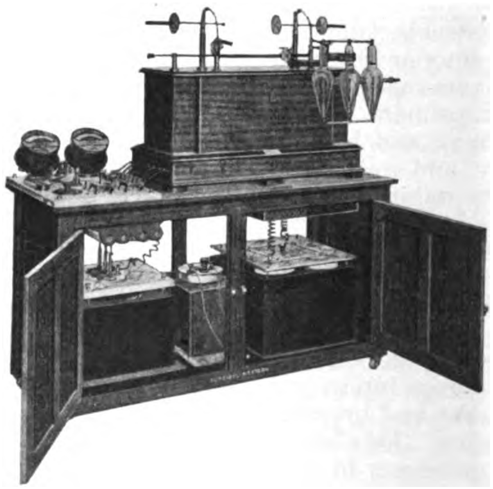
Standard medical induction coil; provided with a switch for opening the primary circuit; arranged to give both primary and secondary currents, the strength of which may be regulated at pleasure; operates on one cell dry battery, but its intensity can be increased by the use of additional batteries. J. H. Bunnell & Co., 32 Park place, New York.



Spark coil designed especially for use in wireless telegraphy; primary, secondaries and condenser all enclosed in a fibre tube. Secondaries wound with enamelled wire. A vibrator with double adjustment giving fast vibrations is also provided. The Electro Importing Co., 223 Fulton street, New York.



Medical induction coil that gives three distinct currents of electricity — primary, secondary, and combined primary and secondary. Equipped with a graduating indicator on the coil, which shows the strength of the current in degrees, and the manipulation of this movable scale also regulates the strength of the current. J. H. Bunnell & Co., 32 Parx place, New York.



Radiographic outfit with 12 inch induction coil and anti-acid interrupter for X-ray treatment. For use on 110 volts alternating current. Core of coil is of Norway iron wire wound with a number of layers of heavily insulated copper wire. Provided with a terminal attachment for regulating the vacuum. Made by Scheidel-Western X-Ray Coil Co., 411-419 South Jefferson street, Chicago, Ill.

A Glance at the Wiring Situation

By J. S. Webster

While so much attention is being given to the consideration of the concentric system of wiring, it seems necessary to consider a number of vital points we have not seen presented, as well as to consider the matter from a broad general viewpoint before attempting to arrive at a definite conclusion. In order properly to compare this system with standardized methods it seems necessary to give a brief resume of wiring during the period of commercial development, keeping in mind especially those points having a bearing on principles as well as on house wiring in particular.

HOUSE WIRING IN THE EARLY DAYS

During the first 10 years the constant voltage or multiple system of incandescent lighting was in use the demand was mostly for commercial lighting. While wires were for some time secured to the surface wired over by metal staples, the 2-wire and 3-wire wooden cleats were soon provided, having V-notches on one side to hold the wires securely to the surface wired over, whether for open or concealed work running parallel with joists. Concealed wires across joists were drawn through gimlet holes only large enough to pass the No. 16 wire, which had sort of a canvas braid, the wires being separated from one to three inches. Much wiring was done without soldering the joints, and many splices were left uncovered.

In early work it was common to connect up to a hundred or more lights with only a fuse on one side of the system at the machine. Some time later single pole fuse "catches" were used, from 6 to 20 of the 50- to 70-volt lamps depending upon one fuse. Mains were just large enough so they would not heat to more than 50 deg. F. above surrounding temperature. A common main was run and a No. 16 tap taken off for each light, the other side being protected by a circuit fuse, when these had come into use. These catches were located in the handiest places to fish from. Sometimes they were behind a piece sawed out of the baseboard, and having a clearance of from 1½ inches to as little as ½ inch when the baseboard was replaced. Where the Edison 3-wire system was used the neutral was the common wire, being only large enough to carry the unbalanced load.

WIRING IN THE EARLY EIGHTIES

Early in the eighties asbestos insulation came into use for dry places, and rubber insulation for damp places and for the better work. These wires were plastered over on new construction. For covering mains in particular, grooved wooden molding came into use, holding wires against the surface wired over. Later a two-piece molding came into being, similar to that now in common use—excepting at present hardwood—with surface filled is the standard. Molding used to be stocked in different woods, to match interior finish, and it was common to employ "wood joiners" to panel a ceiling, the wires being run only where necessary to reach the outlet or a point from which the outlet could be fished. Bare mains of from No. 8 to No. 6 were commonly run in molding, the separation being about ½ inch, but was reduced by the nails or screws used for fastening the back, the cap being secured either by brads or screws.

"Underwriters" white covered wire was used for cleat and molding work, and for some time for concealed wiring, but was largely superceded by double and triple-braided weatherproof and rubber insulation.

The protecting braid was little used on rubber insulation until about 1895. In buildings under construction all of the above mentioned wires were plastered over, without further protection.

WIRING IN THE NINETIES

In the early nineties double pole porcelain fuse blocks came into general use, being placed in wooden cabinets located in closets and halls. These cabinets were asbestos lined.

During this entire period most isolated plants and a large amount of central station lighting was operated at from 70 to 110 volts. The alternating service was largely 52 to 55 volts, with 2-wire distribution. Being limited in many places to 6-ampere fuses, but 6 lights were allowed per circuit, the 56-watt lamp being the standard of efficiency for 16 candle power.

About 1895 the first 220-volt, two-wire central station was installed, and fusible rosettes were subjected to a good test, as 2- and 3-ampere fuses were frequently inserted for each drop light. As this system worked satisfactorily it soon became the standard for small towns in a number of states. Later it was used in numerous large buildings having plants, although the lamp efficiency was much lower and the price much more than the 110-volt lamps operated on the 3-wire system having about the same distribution losses.

During the nineties considerable paper and fibre tubing was used, the high class work requiring brass armor. "Interior," or fibre lined iron piping came into use for the very highest grade of work, special tools being required for connections. With this system the pipes were completely insulated (inside) as were also the junction boxes and cabinets. When used with a high grade of rubber-covered wire this undoubtedly made the safest and most permanent wiring system yet devised, or since introduced. High cost limited its use, however, and it is now but little used excepting for wiring central stations and for underground and marine work.

Flexible steel conduit has become about the standard for fishing and is generally accepted for dry places.

Up to about 1900 the series open arc system was the standard for street and large store lighting. There were many plants using the 4-ampere system. In many towns 4-ampere series incandescent lamps were installed for residence and store lighting, either being run till the plant shut down or turned off by a short-circuiting switch. Wiring for these lights was mostly open knob-and-tube or cleat-work and the pressure ran all the way up to 2,000 volts, from 800 to 1,000 volts being common.

SOME DETAILS OF MODERN WIRING

Complete porcelain insulation should be the object of knob-and-tube wiring. In crowded places flexible fibrous tubing is extensively used. It is the cheapest approved insulation for wires in dry places. Knob-and-tube has been the standard method for concealed house wiring for 20 years. Although hardwood molding has been, and still is, used extensively for open work, its use has been prohibited in a number of cities.

Metal molding has come into quite extensive use, mostly for commercial wiring. It looks better than regular conduit. It was designed to supercede wooden molding, and also conduit work for show windows and exposed work where conduit was unsightly. It is not suitable for wet places, however, and various inspectors limit its use accordingly.

Flexible steel and rigid conduit are the only systems approved in many towns for any class of work.

MODERN WIRING AND THE FIRE RISK

From personal experience in the installation of over 50,000 lamps, and many power plants, the writer has yet to learn of a fire resulting from any of his work—all installed under approved modern conditions. Furthermore, his familiarity with working conditions in over 300 central stations prompts him to add that he knows of very few authentic "electric fires." An examination of some of these so-called electric fires has disclosed not the slightest evidence of such cause. In many cases the real cause was evident. From the reports of some of these fire marshals it appears that when no other cause is readily discovered the report gives out to the public "defective electric wiring," until one is lead to believe that perhaps some inspection departments purposely slander the electrical fraternity for the specific purpose of making their departments appear as an urgent necessity.

The writer has yet to learn of more than about a dozen electric fires that were not directly caused by careless workmanship, defective material, or incompetence in laying out the work. Defective joints and loose contacts probably cause more fires than all other causes combined. The connection of and misuse of heating and motor devices should not be charged to any system of wiring. It is frequently the case that circuits are loaded to double their capacity by adding one device after another, the salesman (so-called) advising that all these utensils having flexible cords and attachment plugs are operated by simply screwing the plug into any electric light socket. If a fuse is blown the customer is told to put in a larger one, until it is common to find 15 and 20 ampere fuses on house circuits, notwithstanding the fact that most fixture arms are wired with No. 18 wire with a rated capacity of only 3 amperes, while the common socket is rated at from 50 to 250 watts. What surprises is that there are not fifty fires from such carelessness and ignorance where one now occurs.

Considering the fact that all of the various systems above enumerated have given quite uniformly satisfactory results when installed and used with intelligence, one must conclude that the fraternity has stuck to pretty safe and sane methods. The one basic rule has been to *insulate both sides of a circuit;* for if insulation is a good thing it is logical to believe that complete insulation is safer and better than a system only half insulated, and depending upon grounding when such connection is so easily disconnected, either by accident or through ignorance.

The whole education and custom of the fraternity and the public so far has been to regard all inside wires and fittings, with a few exceptions, as insulated.

COST OF VARIOUS WIRING SYSTEMS NOW IN USE

As to the relative cost of the various systems now in common use, concealed knob-and-tube work done during building construction is the cheapest. For a five-room cottage it may be given at $30 with switches and fuse-blocks all connected and ready to hang fixtures and connect service wires. Flexible steel conduit will add $10 or $12 more. Rigid conduit will add another $10. Allowing $40 for fixtures gives $70.00, $80.00, or $90.00 for the installation. If the cottage cost $3,000 we have from 1 to 1½ per cent. as the wiring cost, and from 2⅓ to 3 per cent. for the installation ready for use.

Gas piping and fixtures would cost about two-thirds as much. The necessity for re-decorating every two or three years will soon offset the extra cost for electric installation, while on one hand the danger to life and property and, on the other, the safety, health, convenience, decorative effect, and the use of innumerable every-day household devices, places electric srvice in an exclusive class where its extra first cost is not a common serious objection. The average builder will pay as much for one fixture that appeals to his fancy as he would for the entire cost of wiring. For those who must economize, drop cords may be used in most rooms, or simple brackets of about the same cost. If necessary, the entire fixture bill can be kept down to $10 or $12.

The cost of old house wiring may be given at from 50 to 75 per cent. above these figures.

For the better class of residences, electric lighting may be considered a necessity for any modern house, and its entire cost of installation may be offset by the cost of decorating. In the past there has been more objection to the cost of energy than to the cost of installation. In many places this condition still exists. The proper use of high efficiency lamps is overcoming this objection, together with the demand for accessories.

PROPOSED SYSTEM OF CONCENTRIC WIRING

Coming now to a consideration of the concentric system of wiring, one of the first questions to answer is, will it meet the requirements of regular service? If limited to circuits of 660 watts, as seems probable, it will not as this has not met the present demand, and the 10-ampere fuse, allowing 1100 watts appears about to be approved.

As to relative safety, a completely insulated system is none too safe, as evidenced by an occasional fire and death. Where personal safety depends upon the grounding of a number of circuits in an effective manner, the hazard must of necessity be much increased over present methods. In case of crossed and fallen wires or transformer breakdown, the slightest leakage through a socket or other device is sufficient to produce fatal results. With the proposed concentric system with a number of circuits in each house, each of which must be grounded as a reasonable precaution, any of these grounding difficulties, inside or outside, produces the equivalent of a bare system, dangerous alike to person and property. If insurance companies accept such risks before an extended examination and experience demonstrates its safety, it will be in direct contrast to their present methods, as they now have various limitations in policies, the gist of which is not generally understood by the insured.

With the general adoption of alternating current for most residence service, with its high voltage transmission and transformer difficulties even under unfavorable conditions, it seems absurd to abandon standardized methods fulfilling nearly every possible requirement for the sake of adopting a system with such apparent hazard and limitations and which is opposed to the one preponderant requirement of the Underwriters' rules—insulation. While this system has been permitted in Europe in certain cities with such limitations as isolated plant service, individual transformer, etc., some of the most competent station managers refuse to furnish service for such installations, knowing well that they would be held responsible for negligence in case of accident, and to avoid accidents it would be necessary to make frequent detail inspections, the expense of which would more than consume the profit from such customers.

From the standpoint of appearance the concentric has no advantage over flexible steel conduit or even portable cord, when either is bronzed or tinted to match the surface wired over.

In cost, its use cannot be expected to reduce present knob-and-tube or molding work more than a third. Such a trivial saving will not appeal to the public when the extra hazard and limitations are considered.

CONCENTRIC WIRING, THE CONTRACTOR, AND THE CENTRAL STATION

The electrical fraternity would merit censure for such a radical departure when every possible gain is offset by certain objections, and when the loss to established lines of manufacture, sale, and contracting can only result in a temporary gain, if any, which will soon be lost by dissatisfied customers. Central station managers should stand as a unit, along with all others who have the interests of the fraternity at heart, in giving this system a very careful investigation before permitting its use. The recent appointment of a committee of experts to study and report in detail on all wiring systems shows how seriously this subject is being considered by the electrical industry.

Outside of possibly a few manufacturers, the central station operator is most likely to be interested in any system that will very materially reduce the cost of installation, and the central station operator certainly has the most at stake of anyone in the business. The central station operator has good reason to feel that his best interests have not been properly regarded, for the reason that the more expensive features required in residence and commercial wiring seem to be established to protect manufacturers of every new device on the one hand and the journeyman on the other.

To illustrate, about 20 years ago glazed clay tubes, cleats, and knobs were put on the market at about half the price of flint or porcelain fittings. They were much stronger and entirely suitable for concealed and much mill and factory work. With a little more care in manufacturing they would have rivalled porcelain for the job requiring neatness of appearance. A brittle and useless clay product soon followed, with the result that all clay insulators were soon condemned.

Again, the use of leather nail-heads about the same time met all requirements for most of the same class of work, but instead of protecting the customer by specifying the size of nails the journeyman got busy and had municipal inspectors condemn the use of nails, demanding screws (of any old size) instead, as they require five times the labor to install. The politicians were at work. These are only two of perhaps a hundred similar cases.

By a concerted effort central station operators might be able to at least check the unlimited restrictions which increase cost of installation, and might even adopt a commonsense method that would reduce the cost of wiring about 30 per cent. and involve no extra hazard. They might go so far as to carry the insurance of such customers as wished to take advantage of such system, as they could find plenty of insurance companies that would take over the "risks" (in name only) and such guarantee by such responsible concerns would certainly result in modified restrictions. This would not be a backward step in our estimation, but would enable customers to have more to invest in household accessories. We would much prefer running ordinary duplex wire, supported by clamps or wide cleats for either open or concealed work, as compared with the concentric, and very few extra fittings need be provided to make a very neat job. Most of our present fittings would therefore be retained, and as this class of work would be in demand for only a small proportion of the work done the various interests would not be materially affected.

There has been much uneasiness regarding business conditions, and with the uncertain consequences of an almost worldwide war in mind we recall Lincoln's remark that "It is a poor time to swap horses while crossing a stream."

A Plea for the Proposed System of Concentric Wiring

At a meeting of the Committee on Wiring Existing Buildings of the National Electric Light Association in Boston on March 5, H. E. Eisenmenger, of that committee, made a few comments on electric wiring, with special reference to concentric wiring. Believing these comments will interest our readers at this time, when there is so much discussion about concentric versus other wiring, we republish the gist of his remarks for their information and benefit.

Electric wiring, says Mr. Eisenmenger, has been developed along two different fundamental theories.

The original idea was to have a considerable insulation which should be so strong and so substantial that every danger to life and property would be removed by the large safety factor of the insulation itself.

At a later time and paralleling this theory, another theory was developed along the following lines. The insulated wire is surrounded by a grounded metallic tube. In this case a very substantial and heavy insulation is no longer as essential as in the first named theory. Even in case of the insulation becoming insufficient, danger for life and property will always be averted by the interposition of the grounded continuous metallic tube. In order that any danger should arise from a system of that kind two accidental damages must occur at the same time; that is, the ground of the surrounding conduit must be bad and the insulation of the wire must be injured. To obviate this, the American wiring rules regulate, in Paragraph 28b, that the conduit must not only be continuous from outlet to outlet, but also mechanically secured in position. Paragraph 28f says that the metal of the conduit must be permanently and effectively grounded. Furthermore, in Paragraph 28e it is ruled that metal conduits must have the ends provided with bushings so as to protect the wires from abrasion.

Paragraph 28f permits, however, short sections of conduit to remain ungrounded. If in such an ungrounded section, or, in a conduit system, the grounding of which has become insufficient the insulation becomes bad, either by abrasion or by condensing water collecting inside the conduit, the conduit may carry tension, resulting in danger to property and life.

A logical step to obviate this would be to make the conduit tight fitting with an appropriate filling material; for instance jute, to preserve the circular section of the conduit. This close fit prevents any collection of water inside the conduit. At the same time it obviates any possibility of abrasion, the insulation and the conduit being essentially fixed in their relative positions. (Fig. 1.) The conduit will then advantageously have a certain degree of flexibility to make insulation easier.

We thus arrive at the so-called "Kuhlo" or "Stannos" wiring systems, or rather at their first variety, with protective sheath. This variety is used where neither of the poles of the system is grounded.

In central stations with a grounded neutral wire we can go one step further. As the grounded conduit and the grounded neutral wire have no differences of potential between each other, or at best only negligible ones, such as may arise from the voltage drop in the neutral wire, it evidently is unnecessary and therefore wasteful to insulate the neutral wire as heavily as we insulate the potential wire from the conduit. The material used for the insulation of the neutral wire may be either saved entirely without decreasing the factor of safety, or it may be put on the potential wire with a corresponding increase of safety. (Figs. 2a and 2b.)

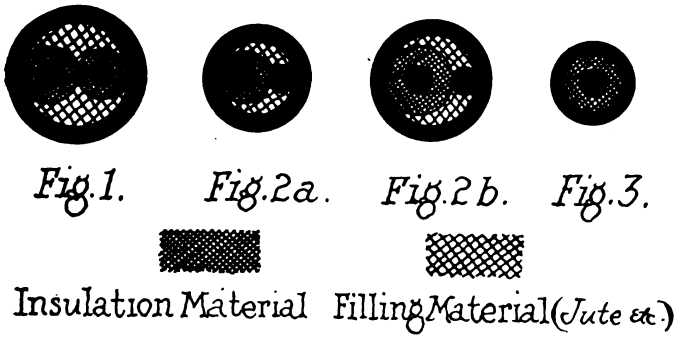


Diagram showing the logical evolution of the proposed concentric wiring system. Three steps in evolutionary process between Figs. 1 and 3.

This results in a grounded continuous conduit and a grounded bare wire running inside the conduit. There is no reason why these two conductors both grounded and both continuous, should not be united into one, in other words, why the conduit should not be used as a return circuit. The idea of using the conduit for carrying the current of the grounded return circuit is not new and has been used for many years with ordinary rigid steel conduit wiring. The difference between this plan and the concentric wiring plan is that in the latter the conduit is close fitting (thus leaving no space for the accumulation of water) and flexible to a certain degree.

This is the logical evolution of the so-called concentric wiring, Fig. 3, about which we hear so much nowadays.

The potential conductor is surrounded by an insulating coating, which, in turn, is surrounded by the tubular grounded outer conductor for the return circuit. For mechanical reasons the insulating coating is covered by paper or braiding which acts as a slip member between the insulation and the sheath in case the wire is being bent.

It should not be lost sight of that this system is not a new untried thing, but was developed five or six years ago. A large amount of this material is now being sold and installed abroad every year.

Organization of the Associated Manufacturers of Electrical Supplies

At a meeting of electrical manufacturers at the Hotel Biltmore on January 12, 1915, an organization committee was appointed to formulate plans for the organization of a national association of electrical manufacturers. This committee at a meeting of the electrical manufacturers called at 10:30 in the morning of March 9, 1915, at the Hotel Biltmore, New York, submitted a resolution for the formation of an association to be known as the Associated Manufacturers of Electrical Supplies, to be national in the scope of its work. Upon motion the resolution was passed and the association declared organized. Following the declaring of the association as being in existence, constitution and by-laws were adopted outlining the work of the association, its objects, initiation fees, and dues. The constitution and by-laws called for a president, a vice-president, a treasurer, a secretary, and a board of governors to consist of 15 men to be appointed by a nominating committee. A nominating committee was therefore formed. This committee nominated the following as governors, the terms to expire as follows: five on April 1, 1916, five on April 1, 1917, and five on April 1, 1918:

A. W. Berresford, Cutler-Hammer Mfg. Co.
Chas. L. Blizzard, Electric Storage Battery Co.
Walter Cary, Westinghouse Lamp Co.
LeRoy Clarke, Safety Insulated Wire & Cable Co.
H. B. Crouse, Crouse-Hinds Co.
D. C. Durland, General Electric Co.
H. R. Holmes, R. Thomas & Sons Co.
J. F. Kerlin, National Carbon Co.
Everett Morse, Simplex Electric Heater Mfg. Co.
J. W. Perry, H. W. Johns-Manville Co.
W. C. Robinson, National Metal Molding Co.
Walter Robbins, Wagner Electric Mfg. Co.
R. K. Shepard, B. F. Goodrich Co.
Gerard Swope, Western Electric Co.
Chas. R. Weston, Weston Electrical Instrument Co.

This board of governors is to elect a president, vice-president and treasurer, and to appoint a secretary. Dues were set at $40 a year for executive membership, and $10 for associate membership, with an initiation fee of $25. No less than 87 manufacturers were represented at the meeting, and 41 of them signed applications for membership in the association.

The meeting suggested to the Board of Governors the formation at such times as may be expedient of the following sections (among others) of the new association:

Rigid and flexible conduit section.
Switch section.
Fuse section.
Fixtures and glassware section.
Heating appliance section.
Lamp section.
Socket, receptacle, and rosette section.
Rheostat section.
Panelboard, switchboard, and circuit breaker section.
Electric sign section.
Conduit fittings, outlet box, and insulating joint section.
Wire and cable section.
Porcelain and insulator section.
Underground conduit section.
Carbon and battery section.
Dental, surgical, and medical apparatus section.
Insulating material, fibre, hard rubber, and asbestos section.
Instrument section.
Transformer section.

Electrical Prosperity Week

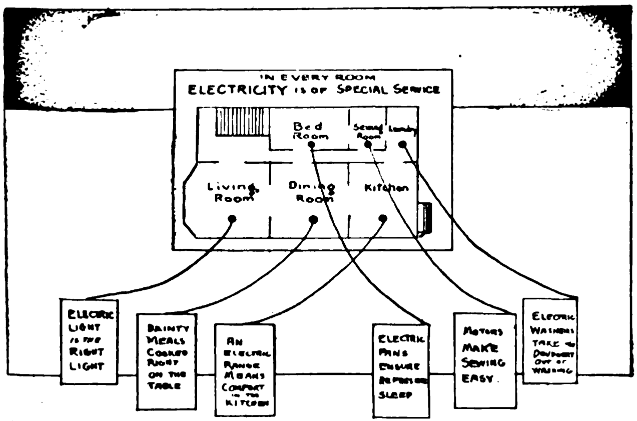
As we go to press word comes that the committee under whose auspices an "Electrical Prosperity Week" will be conducted, have decided to set apart the first week in December of this year for this purpose. The Society for Electrical Development will have active charge of it. Preparations are now being made to handle the campaign. All branches of the electrical industry will be invited to co-operate in the endeavor to make the first week in December the most important, interesting, and valuable week in the history of the electrical industry throughout the world. Various committees are now in process of formation for this purpose.

CONTRACTORS' SCRAPBOOK

"We note in your last issue," says R. G. Littler, manager of the West Coast Engineering Co., Couch Building, Portland, Oregon, "a number of questions asked by a contractor in the Middle West, and he also asks where he can obtain such data. Our recommendation to this man is to take out a membership in the National Electrical Contractors' Association, by addressing Geo. H. Duffield, secretary, Room 41, Martin Building, Utica, N. Y. This association has data and information gotten by the experience of over 1,200 electrical contractors all over the United States, and this man will get more than his money's worth in the first lot of information he receives with his membership, not to mention other data that are continually coming to its members. We have been members of the National Electrical Contractors' Association for years, and we know whereof we speak."

Disconnecting switches, says G. L. Christman in *The Electric Journal*, are knife switches adapted for use with high voltages. They are not used to open live circuits, but to disconnect or isolate apparatus from the circuits and to sectionalize feeders at such times as they are not carrying current. Because of the high voltages they are operated at a distance by an insulated hook stick, or by the remote hand or electrical control. There are three general types—those without porcelain insulators, those with the petticoat type porcelain insulator, and those with the pillar type porcelain insulator.

The accompanying sketch shows a feature for use with a house-wiring campaign. A large panel, cut from composition board or heavy cardboard, has painted on it the floor plan of a house. On the upper section the panel is inscribed "In every room, electricity is of special service." (A panel of this kind can be obtained from a sign or showcard maker at small cost.) From each of the "rooms" an electric cord runs to a card which tells of one of the special services for that room. With the card the device spoken of should be shown. For example, the cord leading from the laundry is attached to a card reading "Electric washers take the drudgery out of washing." Near the card an electric washing machine should be placed. A display of this kind will create more desire for wired homes than a display of wire, sockets, and other material, because people are more interested in results than in means.


IN EVERY ROOM
ELECTRICITY IS OF SPECIAL SERVICE
Bed Room
Sewing Room
Laundry
Living Room
Dining Room
Kitchen
ELECTRIC LIGHT IS THE RIGHT LIGHT
DAINTY MEALS COOKED RIGHT ON THE TABLE
AN ELECTRIC RANGE MEANS COMFORT IN THE KITCHEN
ELECTRIC FANS ENSURE REFRESHING SLEEP
MOTORS MAKE SEWING EASY.
ELECTRIC WASHERS TAKE THE DRUDGERY OUT OF WASHING

Window display suggestion for enterprising electrical contractors.

Bulletin No. 250 has just been issued by the National Metal Molding Co., of Pittsburgh, Pa. It possesses some novel features, such as, for instance: a line drawing of each box and cover; all cuts are placed on the left margins of the left hand pages only, facilitating the easy locating of any type of box or cover; boxes of the same type, having different sized knockouts, are given different numbers. In placing orders, therefore, it is necessary to specify only catalogue number and whether desired in sherardized or enameled finish; a short description as to use of each box and cover is given on facing pages; on pages 66 to 76 inclusive, is a numerically and alphabeticaly arranged index giving numbers of outlet boxes and covers of various manufacturers and corresponding numbers of "National" boxes and covers with catalogue pages on which the latter are to be found.

Inductance is a property always possessed by a wire, but it becomes manifest only under certain conditions. In this respect it is like any other property, such as hardness. A wire is hard under some conditions; under other conditions, such as the presence of high temperature, it loses this property and becomes soft. It might become a fluid, even a vapor. Wire, when formed into a coil and subjected to an electrical pressure which is continuously varying in strength with respect to time, manifests inductance. The inductance disappears when the electrical pressure ceases to vary or when the wire is uncoiled and stretched out in a straight line.

The "telephone trouble shooter" who rides a motorcycle, says a paragraph in "Soldering Kinks," issued by the M. W. Dunton Co. of Providence, R. I., can make use of a hot engine for heating a soldering iron. When copper wires are to be soldered before placing them on a pole or in a box lay the joint on the hot cylinder until it melts the solder.

Fuses and telephone transmitters can be repaired in this manner. "I have many times lighted my alcohol torch with a spark from the spark coil," he adds, "by touching it to the frame of the motorcycle."

"Some Electrical Problems Practically Considered," is the title of a paper presented before the recent convention of iron and steel electrical engineers held in Cleveland, by B. G. Lamme, chief engineer of the Westinghouse Electric & Mfg. Co. It has been issued in pamphlet form by this company. The company will send a copy, as long as the supply lasts, to anyone interested.

CONTRACTORS AND DEALERS NEWS

The contract for the wiring and fixtures for Mrs. John E. Lambs' new residence now under construction, located at Allendale, 5 miles south of Terre Haute, Ind., has been let to the Bennett Electric Co., 511 Ohio street, Terre Haute, Ind. This wiring will be installed in conduit throughout. The wiring is complete, with a number of sets of 3-way switches and 4-way switches, base plugs, and floor plugs in each room. It will be a two and one-half story building with garage being put underground in connection with basement. Fixtures throughout will be indirect and semi-indirect. This concern has just completed the wiring of the new Chero-Cola factory located at Terre Haute, also the Coal Bluff Mining Co.'s new building on Wabash avenue, also the wiring for the Varieties Amusement Co., located at Eighth and Main streets, Terre Haute.

The Haskell Electric Contracting Co., 215 West 125th street, New York, has been awarded the contract for the electric work on the 4-5-story apartment buildings on Valentine avenue near Fordham road, New York. Within the past two years this concern has installed the electrical equipment at the Riviera Theatre and Roof Garden, 97th street and Broadway; Elsmere Theatre, Crotona parkway and Elsmere place; Loew's Boulevard Theatre; Cecil Spooner Theatre, Southern boulevard; Punch and Judy Theatre, the most unique theatre in the United States; Boston Road Theatre, 167th street and Boston road; 6-story factory building, 179th street and Lafontaine avenue; New York Fire Alarm Station, Central Park and Traverse road—all in New York. The most recent contract is for a studio and film factory at 229 West 146th street from the Erbograph Co.

F. O. Peterson, 2002 West Superior street, Duluth, Minn., has the contract for the installation of main feeders and conduit for the power and lighting system, also new main switchboard for a 200-kw. for the Scott-Graff Lumber Co. of Duluth. He also has the following unfinished work on hand: Harriet Beecher Stowe School under construction at New Duluth, Minn, an $80,000 building, where he will install a complete system of Sherrardized conduit both for power and lighting; a programme clock system consisting of master clock with four programme machine with relays; 17 secondary clocks, made by the Self Winding Clock Co. of New York; a fire alarm system and a private telephone system consisting of desk telephone, push button board, and annunciator with reset, and 17 room telephones. The power installation consists of one 10 h.p. motor and two 2 h.p. motors. He has half finished the contract to wire a three story brick building at 8th avenue, East and Superior street, Duluth. The jobs recently completed by him include the wiring and fixtures for Charles Mork & Co.'s brick clothing store in the West End; the second floor of the Kelley Hardware Co.'s building on Superior street between 1st and 2nd avenue. West; the Norton Co.'s warehouse building at 4th avenue West and Michigan street; the Rex Hotel at Solon Springs, Wis., for the Duluth Brewing & Malting Co.; the wiring for the addition to the Rex Hotel at International Falls, Minn.

The Harry I. Wood Co., Inc., 514 West Main street, Louisville, Ky., reports plenty of electrical contract work in hand, with promise of a still more active spring season. Among the jobs now going through is the installation of 21 motors ranging from 5 to 50 h.p. in the cooperage plant of J. Schwarzwalder & Son at Louisville. Here all the wiring is in conduit, and all motors are grouped on six sets of feeders. Another job covers the installation of light and power wiring, magneto clock system, programme bell system, and intercommunicating telephone system in the remodeled old University Hospital which is to be used as a school. Similar equipment will be installed in the new Emmet Field school at Crescent Hill, Louisville. A contract, just completed, with the state of Kentucky covers the wiring of the old State Capitol and Executive Building; also the installation of seven outdoor standards and a transmission line. The wiring in both the above buildings was installed in iron conduit and metal molding, the floors being taken up wherever possible and the wiring concealed therein. Where this was not possible, the wire was installed in metal molding. The seven standards erected were each equipped with No. 648 Holophane unit and 750-watt, 220-volt, type "C" lamps. Safety steel taped, duplex cable was used for the underground construction feeding these standards. The transmission line consisted of 1,600 ft. of 4/0 duplex, steel taped cable, laid underground from the switchboard in the penitentiary engine room to the service switch in the basement of the executive building. The old gas fixtures in the above buildings were wired and equipped with clusters and 16 in. opal shades. The current will be furnished for these buildings from the State Penitentiary, at a pressure of 220 volts.

Gustav A. Butter, hardware jobber and mill worker, at 603 Mitchell street, Milwaukee, Wis., asks manufacturers of electrical goods to send him catalogues and other printed matter. He intends to job electrical goods as well as hardware.

C. J. Quinn & Son have opened a new electrical shop at 33 Church street, Hartford, Conn. They will carry on an electrical contracting and repair business.

The "White Way" at Lexington, Kentucky, now being installed by the Wood Co., will consist of 97 two-light standards, each standard to be equipped with Novalux compensating fixtures, and 300-watt, 20-ampere, type "C" lamps. These 97 standards will be divided on three 2,200-volt series circuits, each circuit controlled by a 6.6-ampere secondary regulator located on one of the Kentucky Utilities Co.'s poles. Two of these circuits will control all standards which will burn until midnight; the other being used for the standards which will burn all night. The wiring for these standards will be underground, No. 6 steel taped cable designed for 4,000 volts working pressure. There will be a positive cutout in the base of each standard to control same. This installation covers the taking up and relaying of about two miles of streets.

Carman & Fryer, 113 N. Noble street, Indianapolis, Ind., have just built a new electrical repair shop. This shop is equipped with crane service which reaches all parts, has an extensive air system for soldering and cleaning motor parts, and a large oven for baking and drying electrical apparatus

A. Edgar Goetz, electrical contractor and lighting specialist, will remove from 51 Barclay street to 55 Barclay street, New York, on May 1. Mr. Goetz is also proprietor of the electrical fixture making and repair business carried on under the name of the A. L. Bogart Co., at 51 Barclay street.

Gray Bros. Electric Co., contractors, will move on May 1 from 160 Cass street to 70-72 State street, Detroit, Mich.

A. O. French, formerly of the French Electrical Repair Co., is now associated with his sons at 108-110 Tenth street, St. Louis, Mo. The new firm will be known as The French Electric Co. and will conduct an electrical contracting and motor repairing business with a large modern equipped motor repair shop.

A new motor repairing concern has just started business at 10 Thatcher street, Boston, Mass. They will do a general motor repair and second-hand business. They will be known as the Boston Armature Works.

The Kelley Construction Co., 318 Gibson street, Eau Claire, Wis., has bought the wiring and supply business of the Wisconsin-Minnesota Light & Power Co., and will operate in both Eau Claire and Chippewa Falls, Wisconsin.

E. W. Lane, 115 West Bremer avenue, Waverly, Iowa, has the contract for building an electric line at New Hartford, Iowa. He will do both the outside construction work and all inside wiring.

A 6-story candy factory at 477-481 Broome street, New York, will be wired and motored by Russell & Co., of 444 Columbus avenue, New York. The wiring will be in rigid conduit. The motors will operate on two-phase, 220-volt, and single phase, 110 and 220-volt circuits.

The Kelley Construction Co., Eau Claire, Wis., has just completed the power installation in Shane Brothers & Wilson's flour mill at Hastings, Minn. The installation consists of four motors with a total capacity of 885 h.p. Other contracts recently completed by this company include the wiring of the addition to the Cornell Wood Product Co.'s plant at Cornell, Wis., and the ornamental street lighting system of Eau Claire, containing 124 light posts equipped with new type C, 100 candle power lamps.

Wm. G. Reuter, 34 East Sixth street, Cincinnati, Ohio, is wiring a new country club house in the suburbs of that city.

The Devere Electric Co., Inc., 234 West Fourth street, Cincinnati, Ohio, is wiring the new garage for the Christian Moerlein Brewing Co. of that place. The brewing concern intends to abandon all horses and wagons and place automobiles in service. They will have space in the garage for about 100 cars. This company has just completed a job for the Irwin Cloak & Suit Co., who have stores in Detroit, St. Louis, Kansas City, and Cincinnati. This was quite a job in the way of show window lighting, fixtures and wiring. It was a hurry up job, the contractor having to furnish and place in position 101 Brascolite fixtures, 75 brackets, 100 drop lights, and 100 show window lights within 8 days of receipt of contract.

The Standard Electric Co., Red Wing, Minn., will install concealed conduit wiring, specially designed fixtures and lamps, and several motors in the new hospital at Red Wing, Minn.

Peet & Powers, 45 West 34th street, New York, will do the electrical work in the new club house now building at Pelham, N. Y. The contract calls for BX cable and Standard panels. The fixtures will be contracted for separately.

The Herman Andrae Electrical Co. Inc., 135 Sycamore street, Milwaukee, Wis., has the contract for the electrical work in the post office building at Delevan, Wis. Other post offices in which this company will install the electrical work are those at Livingston, Mont.; Amarillo, Texas; Sparta, Wis.; Ishpeming, Mich., all of which jobs are wired in conduit, complete throughout. Another contract is for the Appraisers Stores building in Milwaukee, the work to be done under the direction of the Supervising Architect at Washington, D. C., which is to be carried on in the same manner and under the same supervision.

The new club house for the Oak Park Country Club, at Oak Park, Ill., will be wired by the White City Electric Co., 14 North Franklin street, Chicago, Ill. The grounds cover the farm until recently known as the Evans Game Farm for the propagation and domestication of American game birds and fauna. Complete lighting, annunciator, and telephone systems are to be installed with provision for power for pump house to take water from the Desplaines River for irrigating the club grounds. The electrical installation is to be a conduit job throughout.

The electric work at the Roxbury Boys' Club, Roxbury, Mass., will be done by the Stephen F. Gardner Electrical Co., 114-116 Bedford street, Boston, Mass. This house has been wired in the knob and tube system. The building is a modern club house with game rooms, music rooms, reading rooms, gymnasium, swimming tank, and bowling alleys. All of these rooms are lighted with Benjamin clusters. The gymnasium and swimming tank are also illuminated by this style of fixture. Roebling's wire has been used throughout the building, together with Sterling flexible armored cable, Bryant-Perkins flush switches, and Bryant-Chapman receptacles.

The R. Haas Electric & Mfg. Co., 305 East Monroe street, Springfield, Ohio, has been awarded the contract for the electric light wiring for the Amusement Hall for Boys at St. Charles, Illinois. This wiring includes everything necessary for an up-to-date theatrical hall. All material to be the very best. All lighting is to be controlled from two panelboards, one in each end of the building.

The New England Engineering Co., New London, Conn., has the contract to install the electrical work in the Crocker House of New London. Semi-indirect fixtures will replace those now in use.

Wood Brothers, Charlevoix, Michigan, have the contract for the electrical work in the addition to the Beach Hotel at that place. The contract covers conduit wiring for lights and elevator power with switches, panelboards, also annunciator and communiphone systems. This hotel is located on a bluff overlooking Lake Michigan. Has four stories above the street and three below, thus making a seven story structure on the lake side. The first floor below the street contains a casino with a complete electrically equipped stage.

The Bucyrus Light & Power Co., of Bucyrus, Ohio, has the contract to equip the Marlowe Moving Picture Theatre at that place. The equipment will consist of: a 75-ampere Fort Wayne a. c. to d. c. compensarc; two special Precision Machine Co. variable speed motors for direct connection to Simplex motion picture machines; one 1/6 h.p. General Electric, 1,200 r.p.m. rewinding motor for electric piano; one ¾ h.p. General Electric, 3,600 r.p.m. motor for direct connection to blower for piano; one ¼ h.p., 1,800 r.p.m. General Electric motor, direct connected to pump for handling condensation in steam heating system to heating boiler; one 3 h.p., 1,400 r.p.m. motor belted to fan in ventilating system. The lighting system consists of eight semi-indirect bowls with the usual lobby lights studded in border, ceiling, and front arch. This is a new one story brick theatre built expressly for this business.

T. O. Myers has been awarded the contract for wiring the new $75,000 high school at Montpelier, Ohio. The wiring will be done in conduit.

The Reliance Electric Co., Uniontown, Pa., has closed a contract with the New Salem, Pa., school board for the complete installation of electric wiring in conduit and semi-indirect fixtures in the new schoolhouse at that place. This company is now working on the new B. P. O. E. home at Uniontown. It is also a conduit job and will be equipped with special semi-indirect fixtures containing the new Type C lamps.

Herbert E. Francis, electrical contractor, 155 Church street, New Haven, Conn., is wiring the four-story building at 187 Church street, New Haven, known as the Walker Building. It is an iron conduit job with the upper stories fitted for offices. He also has the contract for all the electrical work, including motors, private telephones, and electric lights in the apartment house now building by the Tudor-Manor Co., on Park street, New Haven, Conn. Still another contract is for electric lights, private telephones, and annunciators, in the large residence on Whitney avenue for Mrs. N. Bronson.

The Robbins Electric Co., 916 Kansas avenue, Topeka, Kans., has the contract for wiring an eight-apartment California style flat for Claude E. Neil, located at 205 West 11th street, Topeka, Kans. This is a conduit job throughout, and speaking tubes and door bells will be installed. This company also has a contract to wire a two-story building located at 920 Kansas avenue for the Kansas Childrens Home Society. This building will be two story consisting of store rooms and offices. It will be a rigid conduit job throughout. Another contract calls for the wiring of a house at 1328 Quincy street, Topeka.

The Electric Service Co., 115 West Colfax avenue, South Bend, Ind., is wiring the priest's house of St. Mary's Church, Notre Dame, Ind. Rigid conduit will be used throughout.

W. A. Corrao, Syndicate Trust Bldg., St. Louis, Mo., has the contract to wire and equip a new 8-story mercantile building at 9th street and Washington avenue, St. Louis. This building will be occupied by the Lindel department store.

George W. Brennan, 2026 East 3rd street, Dayton, Ohio, will install concealed knob and tube wiring for three-way, 220-110-volt alternating service in St. Adelbert's Parsonage at that place. All the rooms have flush switches, the hall being equipped with a double set of 3-way switches with a 4-way in one set. In the living rooms there are baseboard receptacles and flush receptacles for electric irons on separate socket. In each room there is a baseboard receptacle on a separate socket. The door bells will be run from bell ringing transformers. Seven circuits will be required to take care of the completed equipment.

In some respects the electrical installation in the Salem Reformed Church, at 7th and Chew streets, Allentown, Pa., is novel. The novel feature perhaps is the equipping of the pews in the main aisle with telephone receivers for people who are hard of hearing. The lectern and pulpit will have a 4-point transmitter cases to catch the sound. The receivers will be adjustable to 5 points, according to the degree of deafness of the person using them. The equipment will be of Western Electric make. The illumination features include X-Ray reflectors and mazda lamps, the reflectors being concealed by the ornamental plaster work. In the basement Alba semi-indirect bowl fixtures will be used. The organ loft will be equipped with an Austin electric organ operated by a 3½ h.p. Century single-phase motor. Both stationary and portable electric vacuum cleaner systems will be employed. The contract is in the hands of the Crescent Electric Co., 724 Court street, Allentown, Pa. This company has the contract for the wiring, fixtures, and power plant, at New Tripoli, Pa., a mountain summer resort. Here a Western Electric isolated plant will be installed.

GLEANINGS FROM THE N.E.L.A. QUESTION BOX

Reprinted from the Bulletin of the National Electric Light Association.

What is the practice of member companies in regard to leaving meters in vacated apartments, offices and stores when the chances for a new tenant and customer are very good? Has this practice not the advantages of saving money, saving labor and ensuring prompt service? When it is done is the main switch pulled and are all fuses, including branch fuses, removed? Is a record kept of the number, type and size of the fuses removed, so that when a new customer moves in this information can be obtained at once?

Is any sort of short-circuiting device installed to prevent tampering? What has been the percentage of meters tampered with and in such cases has any bad effect shown up on the meter, caused by the short-circuit?

C. E. Brenton—Our company makes a practice of leaving meters in vacant apartments, offices and stores for a period of three to five weeks after the customer has given notice to discontinue service. Disconnection is made by merely unscrewing the fuses and leaving them loose in the sockets. Quite generally, as a protection against theft of electricity, the terminal wires are removed and taped. Another precaution taken is to insert pieces of paper in the fuse sockets and screw the fuses back into position. This method requires no record of the number, type and size of the fuses and since it is not customary to remove the fuses the company is very seldom charged with having taken them. The meter reading sheet is not removed from the route book until after the meter is removed, thus providing for automatic inspection. Of course, in some districts of the city we do not leave our meters at all, but the number of meters tampered with when left in vacant premises is very small.

P. T. Davies—This company makes a practice of leaving meters in premises and the lines connected for a reasonable period, *i. e.*, 2 to 3 months, where the prospect of incoming tenants using the service is good. Meters, however, are read at the time when the outgoing tenant leaves the premises and the new customer is billed from the meter reading taken at that time. There is no doubt that a great deal of expense is saved by this practice, and furthermore the new tenant does not have to wait for service.

We do not remove switches or fuses nor use short-circuiting devices to prevent tampering with connections, as we have not found that there is any extensive tampering with meters carried on in this locality.

We depend upon meter readers to follow up empty houses thus equipped, and the meters are still kept on record and visited as if there were a tenant in the premises.

We have not had any trouble in obtaining contracts from customers when we have found them using current without previously applying for it.

William Gould—The New York Edison Co. does not under any conditions remove a disconnected meter from an apartment, as in the city the chances for its being used soon by a new tenant are very good. This is our practice also regarding vacated offices, stores and other premises. If the inspector in the district finds after three months of non-use that there is little prospect of a new tenant, the meter is then removed.

We have found that to remove and re-install a meter is more expensive than to allow it to remain unused for a period, say three months, taking into consideration the fact that there is every possibility of a new tenant moving in during that period.

We have a bureau devoted to the unused meters of the company, and shall be glad to furnish further details if they are of interest to the member companies.

Laurent Heaton—To eliminate the "lost motion" involved in removing and resetting meters in apartments and offices where the tenants change, this company has adopted the following method which has been in use for some time and has the advantages mentioned in the question.

When notice is given by a customer that he is vacating his premises, the order to read and shut off his meter is issued to the meter department on a regular form tag, giving the street and number and also the company's serial number on the meter. The meterman enters the meter index and the date in the space provided on the lower part of the tag, which is then torn off on the perforated line to be returned to the bookkeeper. The main fuses are then removed and the main switch is opened and to it is tied the upper part of the tag, on which is printed in red ink on both sides a suitable warning. When the new tenant moves in he is thus compelled to make application for service in the regular way at the office. A list of the meters thus disconnected is always at hand by filing the stubs according to the numbers which they bear, and as a further check a "Meters in Suspense" book is kept, by reference to which a list is made up every three or four months showing the premises where renewal of service has not been applied for. "Remove Meter" orders are then issued and these meters are placed in stock again.

What do member companies consider the greatest obstacle at the present time in the path of electricity as applied to cooking?

W. G. Clayton—We consider that the greatest obstacle in the path of electricity as applied to cooking is inefficient and unreliable heating devices. We have tested out thoroughly practically every electric range on the market, and thus far none of them will "stand up" when used exclusively for cooking for the average family.

L. J. Lamberger—The greatest obstacle at the present time in the path of electricity as applied to cooking is the large amount of current consumed by the heating elements used.

C. N. Lewis—One obstacle in the path of electric cooking to-day is the high current consumption of cooking apparatus. A great majority of the central stations cannot give a rate cheap enough to compete with other fuels. If the electric heating manufacturers will market more efficient apparatus there will be no necessity for having a rate cheaper than the average power rate.

We have just changed our method of charging for service from a flat to a metered rate and would like to inquire what is the most successful method of reading meters in an installation of one thousand scattered over a rather large area. Is the service more efficient when one man does all the reading or should one man be put in each district?

Will Browne—This is a difficult question to answer without more detail as to general conditions, possibilities as to transportation, etc.

However, unless the area is very large and the installations much scattered, one man should be able to read the meters successfully. His work should be checked at short intervals to see that he is not perpetuating mistakes either by accident or design. In a general way we would conclude that with 1000 accounts the work of meter reading could, for a few days each month, be divided among a few employees who are otherwise engaged during the rest of the time.

Charles Yentsch—The greatest proficiency in work comes from specializing and, hence it is better to arrange the meter reading to be done by as few men as possible, rather than to do the work in one day with a number of men. Besides, this equalizes the bookkeeping and collections, bringing them to a daily basis.

Large companies do a certain amount of meter reading each day in the month in order to average up the work, and small companies will get the best efficiency by following the same principle.

The best man for this job should be picked out from his force by Querist, and an alternate selected as a reserve in case of sickness. The one man should work at meter reading for as many days as are needed to complete the job each month, this depending on local conditions.

Will some of the member companies tell us of a method for cleaning the cloth wipers used in powerhouses for wiping down machinery, and the cost a pound for doing this? We use white cotton factory remnants which cost us 13½ cents a pound, plus freight and haulage charges. Would it be cheaper to buy new material than to clean the wipers?

A. L. Penniman, Jr.—We are using "white waste" costing approximately nine cents a pound plus freight and haulage, and we clean this waste perhaps 20 times before it is discarded. An outfit which will work satisfactorily may be purchased for about $250, the cost of operating being practically nothing. We find that waste which has once been washed is more satisfactory for wiping down machines due to the fact that the lint has been removed.

What is the reason for using brass instead of iron for the cooling coils in water-cooled transformers? Why would lead not be more suitable?

W. M. McConahey—Iron cooling coils are used in water-cooled transformers to some extent because of their cheapness, and this is about the only argument that can be advanced in their favor. Oxidation or rusting takes place with iron very easily and when it has once started it is almost impossible to stop it. In addition to slowly destroying the coil, the rust also roughens the inside surface and tends to collect matter carried in suspension by the water. In this way coils may gradually become clogged and stopped up entirely, or their effectiveness for cooling be greatly reduced.

Good brass coils are not attacked by the impurities ordinarily found in water. There are places where brass will be attacked but these are not many. In such cases the best material to use for cooling coils is copper. Lead would not be satisfactory because of its poor mechanical qualities and liability to injury, besides the difficulty of making joints and attaching to piping.

Are any companies paying bonuses to meter readers and upon what basis, correct readings, number of readings or other good points?

William Schmidt, Jr.—Our meter readers are paid a weekly salary. They read both gas and electric meters. Throughout the year 1,703,709 meter readings were taken. The total number of errors discovered was 356, or an average of one error per man per month. The average time of reading a meter was 1.9 minutes.

The records for the year ending December 31, 1913, show 1,597,851 meter readings. The total number of errors discovered was 630, or an average of 1.8 errors per man per month. The average time of reading a meter was 1.9 minutes.

The records show also that one meter reader during two years has read approximately 142,543 meters and thus far not one error has been charged against him. During the past year we have had in our employ another meter reader who has read about 75,000 meters and has not had an error charged against him.

Why is nitrogen placed in the new type C lamp? How does it increase the efficiency of the lamp?

"Wire & Pipe"—Instead of operating in a vacuum, the filament of the new high-efficiency lamp is surrounded by an inert gas, e. g., nitrogen, at a pressure of about one atmosphere. This inert gas retards the disintegration of the filament, permitting lamp operation at a higher and more efficient temperature. The heat dissipation attendant upon conduction and connection currents set up in the gas is minimized by the closely wound construction of the filament.

What is the average breaking pull of a standard N. E. L. A. locust pin, the pull being applied at the neck of the insulator, the insulator and pin being mounted on a standard cross-arm?

Thompson Cummings—A test of eighteen N. E. L. A. standard 1½ in. by 9 in. wooden pins with 1 in. threads was made in our laboratory recently. All pins were of first-class locust, free from cracks and wormholes. Seven were new pins which had been kept in a dry storeroom for three years, and the other eleven had been in service on arc and 2200-volt circuits in Pittsburgh for an average period of four and one-half years, terminating a year ago, since which time they had been lying in our office.

A load similar to that of a dead-ended wire was applied at the groove of the double-petticoat, deep-groove insulator by means of an Olsen testing machine of 30,000-pounds capacity. The pins were inserted in a 1½ in. hole in a cast-iron block, so that there would be no variation in the results noted, due to injury to the cross-arm. About half of the pins were pulled in a direction across the grain of the wood; the others, with the grain.

The average breaking strength of the eighteen pins was 1365 pounds, the minimum being 400 pounds and the maximum 2100 pounds. In nearly every case failure was due to the pin splitting from the lowest thread to the base and then breaking off just under the shoulder.

For the sake of comparison it is interesting to note that at 1365 pounds a steel pin of ¾ in diameter, Western Union type, showed a deflection of ½ in., and a ⅝ in. pin a deflection of ¾ in.

RECENT LEGAL DECISIONS

Of Special Interest to Electric Light and Power Stations

Licenses to Electric Wire Men—Power to Require

In a prosecution for violation of the ordinance of a town owning an electric light plant requiring electric wire men to procure a license, and to execute a bond in the sum of $1,000, conditioned on their indemnifying the town and the superintendent of public works from liability for any damage arising from any negligence in doing their work, it was held that the town was not authorized to adopt such an ordinance by Iowa Code secs. 680, 695, 711, empowering municipal corporations to adopt ordinances to carry into effect duties conferred, and to make regulations against danger from accidents by fire or electrical apparatus, etc.

Town of Akron v. McElligott, Iowa Supreme Court, 147 N. W. 773.

Defective Wire—Liability of Employer

The janitor of a building, while investigating a leak in a water pipe in a cellar, attached a lead wire, carrying a bulb for illuminating purposes, to the electric system. While holding the bulb in his hand he received an electric shock which caused his death. In an action for damages therefor, there was evidence to show that there was a defect in the lead wire at the point where it connected with the bulb, and that this defect enabled the current to escape into the hand of the decedent, producing paralysis which prevented him letting loose, and that during the period preceding the arrival of help he was receiving the current which resulted in producing his death. It was held that this lead wire was undoubtedly a part of the plant of the defendant, the owner of the building, and as such it was the duty of the master to use reasonable care to see that it was free from defects endangering the lives and limbs of those employed in the premises, even though another lead wire which was perfect was also furnished. Judgment for the plaintiff was affirmed.

McCaughan v. Home Savings Bank, N. Y. App Div., 145 N. Y. Supp. 105.

Construction of Franchise—Furnishing Power for "Municipal Purposes"

A franchise was granted by a city authorizing the construction of an electrical power plant. It required the grantee to furnish to the city such arc lights as might be required for lighting its streets at the rate of $5.50 per arc light of 2,000 candle-power per month, and a certain number of incandescent lights and arc lights for city buildings free of cost, and it further provided that there should be furnished to the city free of cost such electrical power, not exceeding 50 horsepower, as might be necessary for use by the city for "municipal purposes," and "such other power as may be required for municipal purposes at the same prices that are paid by the most favored customer" of the grantee, provided the city gave 90 days' notice of its intention to use power in excess of 50 horsepower. In an action arising out of a dispute as to the construction of this section of the franchise, it was held that the city could require the grantee of the franchise and his assigns to furnish it with electrical power in excess of the 50 horsepower provided, for the purpose of operating an electric plant for lighting the streets, etc.; such a use being for "municipal purposes," within the franchise agreement. The city would not be bound by implication to take any arc lights from the grantee, in the absence of an express provision requiring it to do so; the contract merely giving the city an option to purchase power from the grantee. The grant of the franchise was held to be sufficient consideration for this option. The city was not required to take the minimum amount of power contracted for by the most favored customer of the power company in order to demand such additional power. The word "required" was held to refer only to the power which might be necessary for municipal purposes as provided, and the word "price" to mean the rate fixed by the contract for the sale of power to such favored customer, irrespective of such incidental considerations as that the contract with the most favored customer, which was an electric company, avoided competition between it and the grantee of the franchise, and that it was to furnish transmission lines for a part of the distance, etc.

City of Colorado Springs v. Pike's Peak Hydro-Electric Co., Colorado Supreme Court, 140 Pac. 921.

Contributory Negligence—Grasping Obviously Charged Wire

A guy wire charged with electricity had become broken or detached, and hung suspended near a wooden pole. In swaying to and fro in the wind the wire periodically touched the pole, emitting sparks which burned a small hole in the pole. The fire department was called by telephone and responded. Meantime the fire had been put out. A fireman was stationed by his lieutenant to keep passers-by away from the pole. He grasped the wire with his bare hand in an attempt to break it down, and was killed. In an action for his death it was held that, being a man of 26 years of age, who had passed a civil service examination, he was guilty of contributory negligence, and no recovery could be had for his death.

Glander v. Milwaukee Electric Ry. & Light Co., Wisconsin Supreme Court, 144 N. W. 972.

Percentage Contract—Reimbursement of Personal Injury Claims

A contract by the plaintiff, an electrical company, to electrify lines of the defendant's railroad, stipulated for a compensation to the plaintiff of 10 per cent. of the actual cost in addition to such actual cost for services, labor, material, etc. The term "actual cost," as defined by the contract, included all disbursements for machinery, apparatus, materials, supplies, labor, and service required, and miscellaneous charges such as fire and casualty insurance, costs of accidents, etc., but excluded overhead charges. In the course of the work one of the plaintiff's servants was seriously injured through the plaintiff's negligence, for which he recovered a verdict of $25,000, of which $5,000 was paid by a casualty insurance company in which the plaintiff held a policy, and the remainder, plus costs and expenses, was paid by the plaintiff, who brought an action against the railroad company to recover the sum so paid. It was held that the plaintiff was entitled to recover, especially as, prior to the accident, the defendant had approved a payment by the plaintiff in settlement of a prior accident.

Westinghouse, Church, Kerr & Co. v. Long Island R. R. Co., N. Y. App. Div., 145 N. Y. Supp. 201, affirming 80 Misc. 127, 141 N. Y. Supp. 644.

Evidence of Cause of Injury

In an action for the death of a mine employee from an electric current coming from a feed wire through a signal wire which he was operating, there was evidence that the range of oscillation of the signal wire was sufficient to allow it to come into contact with feed wires, from one of which the insulation had been broken several days before the accident, the contact being indicated by a deposit of solder on the signal wire. The evidence was conflicting as to whether the control of the electric wire was in the mine foreman or in an electrician assigned to the duty by the mine superintendent. It was held that the questions whether the accident was due to the cause claimed by the plaintiff, whether the defect in the feed wire would have been discovered by adequate inspection, and in whose control the wire was, were for the jury. There was evidence that the deceased and his assistant were unable to release their holds on the signal wire until the controller was moved by a third person. It was held that, though this showed that the shock was continuous and not momentary, it was not proof that it resulted from an unexplained cause, and not from contact with an oscillating signal wire and the bare feed wire, since the oscillation of the signal wire may have caused it to become entangled with the feed wires and thus produce a continuous current.

Gallagher v. Black Creek Coal Co., Pennsylvania Supreme Court, 91 Atl. 892.

Liability for Injury to Telephone Wires by Contact

In an action for injuries to the plaintiff's telephone apparatus, it appeared that she owned and managed a telephone plant in a town, in which the defendant owned and operated lighting wires. At certain places, these lighting wires crossed above plaintiff's wires not more than 6 to 12 inches, notwithstanding, according to the plaintiff's testimony, they should have been three feet above. The defendant's wires were so placed after the plaintiff's wires had been strung. When heavily charged with electricity they sagged and at places came in contact with the phone wires. The plaintiff protested vainly to the defendant of this proximity. At last injuries to certain of the plaintiff's apparatus was caused by contact, for which she sought damages.

The defendant contended that there was no evidence that would render it liable for any negligence whatever; but it was held that the placing and maintaining of electric light wires above and in such close proximity to telephone wires that the former, when charged with electric current, sagged and came in contact with the latter was sufficient to justify an inference of negligence and make a prima facie case of right to recover for injuries upon that ground. The defendant also contended, and requested the court to instruct the jury, that the burden was upon the plaintiff to prove that she had a right to maintain her wires in the street as a condition precedent to her right to recover; but it was held that it was properly assumed that the plaintiff and the defendant were each maintaining wires in the public highway in the exercise of a franchise, in the absence of any showing to the contrary.

Weleetka Light & Water Co. v. Northrop, Oklahoma Supreme Court, 140 Pac. 1140.

Fellow Servants

An employee was injured through the negligence of a foreman, while he was assisting in the erection of poles on which wires were to be strung. The foreman at the time of the injury was not performing a duty belonging to the master, or doing anything in the line of superintendence, but was merely doing work on the same footing as the other employees. It was held that the injured employee could not recover from the master.

Reeser v. Metropolitan Electric Co., Pennsylvania Supreme Court, 91 Atl. 1043.

Municipal Lighting Plant—Consent of Commission

Wisconsin Laws 1911, c. 596, so alter and amend any franchise theretofore granted to any public utility by the state, or through any of its agencies, as to constitute it an indeterminate permit within St. 1898, § 1797 m 1 to § 1797 m 108, as added by Laws 1907, c. 499, inclusive. Section 1797 m 74-3 of that statute prohibits any municipality from thereafter constructing any public utility plant of its own where there is already in operation in such city, under an indeterminate permit, a public utility engaged in similar service, without first securing from the Railroad Commission a declaration that it is required by public necessity and convenience. It is held that, under the provisions, a city could not, without first obtaining such declaration, engage in commercial lighting with its own lighting plant when there was already in operation under a franchise another lighting plant, notwithstanding a reservation in the franchise of the right to thereafter erect its own plant, and do commercial lighting, since the effect of Laws 1911, c. 596, was to substitute for the then existing franchise the provisions of St. 1897, § 1797 m 1 to 1797 m 108.

Wisconsin Traction, Light, Heat & Power Co., v. City of Menasha, Wisconsin Supreme Court, 145 N. W. 231.

Resolution of City Council Not Admissible in Evidence as Against Lighting Company

In a joint action against an electric light company and a city for the wrongful death of a person caused by coming in contact with a charged guy wire, it was held to be error to admit in evidence as against the light company a resolution of the city council reciting that the company was negligently permitting its wires to be in a dangerous condition, and instructing the city attorney to begin whatever proceedings against it be deemed necessary if it failed to place them in good condition after notice. This amounted to a statement that the lighting company was guilty of negligence.

Shawnee Gas & Electric Co. v. Motesenbocker, Oklahoma Supreme Court, 138 Pac. 790.

MANUFACTURERS' NEWS

Usona Manufacturing Co., Inc., recently incorporated in the states of New York and Ohio, has opened eastern offices at 1 Hudson street, New York. This concern will manufacture and market an extensive line of high grade flashlight cases, battery lanterns, batteries, and miniature lamps under the name of "Kwik-Lite." The company announces that it has secured exclusive rights to the Beers lantern which will be added to its "Kwik-Lite" line. Geo. G. Beers will be in charge of the New York office and Frank Stout, formerly with Bryant Electric Co., will be sales manager.

Harry A. Yerkes, inventor of the Yerkes chimes and bells, has become associated with the Betts & Betts Corporation, 256 West 55th street, New York.

A. R. Johnson, formerly sales and advertising manager of the Thordarson Electric Mfg. Co., is now secretary and sales manager of the Jefferson Electric Mfg. Co., 847 West Harrison street, Chicago, Ill. J. C. Daley, formerly designing and electrical engineer of the Thordarson Electric & Mfg. Co., is treasurer of the above company.

The Standard Electric Incubator Co., Inc., formerly located at 76 Greenwich street, New York, will in future be known as the Lo-Glo Electric Incubator Co., Inc. The new company will retain the old street address.

W. S. Thomas, treasurer of the Wagner Electric Mfg. Co., of St. Louis, has also been elected a vice-president of that company. Walter Robbins, for many years assistant general manager, has also been elected a vice-president.

The New York display rooms of the Art Metal Works have been moved from 7 Mulberry street to the McCutcheon Building, at 347 Fifth avenue.

The Elkins Glass Co. has removed its offices from Fourth avenue, Pittsburgh, Pa., to Monaca, Pa.

The Electrocraft Co. has removed from the southwest corner of 23rd and Hamilton streets, to 2335 Callowhill street, Philadelphia, Pa.

The Western Lumber & Pole Co. has removed its headquarters from Suite 645, Electric Building, Denver, Colo., to Spokane, Washington.

The Sangamo Electric Co., of Springfield, Ill., has just closed a contract with the Pullman Co. for several thousand ampere-hour meters. This is the second large contract for this type of meter given the Sangamo Co. by the Pullman Company. As rapidly as possible, each and every Pullman sleeping and parlor car is being equipped with a Sangamo ampere-hour meter, to control the battery charge by the method developed by Ernest Lunn, chief electrician of the Pullman Co.

Edward Miller & Co.,, now situated at 63 Pearl street, Boston, Mass., will move to larger quarters at 201 Congress street, about April 1.

The Safety Electric Co., of Chicago, has moved from 342 North Michigan avenue to 537 North Dearborn street, where it will occupy the entire building.

The Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., reports the receipt of orders for a large number of street railway motors and power transformers.

The Metropolitan Electric Protective Co. of 130 West 26th street, New York, offers the trade a complete burglar alarm system ready for installation, including wiring diagrams and detail information that will enable any ordinary electrician to install it without having had previous burglar alarm wiring experience.

This year "Hotpoint Week," as established and carried on under the direction of the Hotpoint Electric Heating Co., of Ontario, California, will be held from May 3 to 8. During that week the company will sell its El Grilstovo at 35 per cent. off the regular price.

The first school clock system installed in New York by Betts & Betts Corporation, 256 West 55th street, New York, is in the Wadleigh High School at Amsterdam avenue and 104th street.

The Burke Electric Co., of Erie, Pa., has recently made arrangements whereby George Hills, an expert on electric welding, has become head of their arc welding department. Mr. Hills will be located at the main office and works at Erie, Pa. Where welding or cutting is being done by any other systems—forms of oxy-acetylene for instance—it can in most cases be done more economically and better by electric methods. The Burke Electric Co. will investigate and report with recommendations on welding or cutting problems which may be brought to its attention.

On account of the rapid increase in business of the Connecticut Telephone & Electric Co., it has been necessary to make an extension to its plant by another addition of approximately 50 x 100 ft. This building when completed will have four floors and a basement, and will be of modern brick mill construction with all up-to-date appliances. This building will be completed for occupancy by April 15, and will be largely devoted to the manufacture of Connecticut automatic igniter systems. This makes the third modern extension to their plant within the last few years.

A. C. Mannweiler Co., 2719 Broadway, Fort Wayne, Ind., manufacturer of miniature incandescent lamps, is now making a complete line of lamps for automobiles.

The Oshkosh Mfg. Co., Oshkosh, Wis., is shipping large quantities of outdoor electrical construction tools to Australian, South American, and South African jobbers. The increasing export business of this company has made necessary the opening of an export department with E. H. Hoffmann in charge.

Robbins & Myers Co., Springfield, Ohio, report that business has increased so rapidly since the first of the year that several of the works departments are running on overtime.

The vertical lift bridge over the Willamette River at Portland, Oregon, is electrically operated, direct current motors using street railway current being employed. The lower lifting deck is raised to its full height or lowered in 30 seconds and both decks are then raised to their full height or lowered in 60 seconds. The control of the movement of these decks is handled by Cutler-Hammer apparatus, and operated by one man.

A 32-page illustrated catalogue was issued last month by Jordan Bros., Inc., 74 Beekman street, New York. Following a brief and readable history of the development and purpose of this device, there are many half tone cuts showing special applications of the Jordan commutator truing device to generators and motors in regular service.

"Kwik-Lite Products" is the title of an unusually attractive catalogue on flashlights and flashlight batteries, lanterns, just issued by the Usona Mfg. Co., Inc., 1 Hudson street, New York. The cover is finished in black, gray, gold, and red. Coated paper, good type, and numerous first quality half-tone cuts go to make up the 32 pages of the catalogue proper.

Edwards & Co., Inc., 140th and Exterior streets, New York, are distributing a novel advertisement of "Dixie" annunciators in the shape of a book cover with a substantial lead pencil for the back. The pencil is held in place by folding the back over it, fastening with wire staples, and tucking in the ends.

The Manati Sugar Co., in the Province of Oriente, Cuba, with offices in New York, has recently placed an order with the Westinghouse Electric & Mfg. Co., East Pittsburgh, for electric motors to drive all of its machinery in its new mill with the exception of the engine-driven rolls. This order covers a total of thirty-two alternating current motors, having a total capacity of 1,042 horsepower.

Catalogue No. 400, dated February 1, 1915, has just been issued by the St. Louis Malleable Casting Co. It contains 192 pages of text and illustrations, also 4 pages of index, of the many electrical devices made by this company. An unusual feature in this catalogue is the 3-page supplement in the front showing illustrations of some of the new designs described and listed in the body of the catalogue.

The Diehl Mfg. Co., Elizabeth, N. J., has just published a booklet entitled, "Diehl Fans," which will be used for general dealer distribution. It contains 20 pages. and an attractive cover, is illustrated with halftones and can be enclosed in an ordinary business envelope together with double letter sheet of sixteen-pound bond under 2-cent first-class postage.

A 48-page catalogue recently issued by the E. H. Freeman Electric Co., of Trenton, N. J., contains explanatory text and half tone cuts of guaranteed wiring devices made by them. Fifty-four different Freeman devices are shown.

BRANCH OFFICES AND AGENCIES

Do you want an agent? If so, we will put the notice here free. The same privilege is extended to agents desiring to represent manufacturers.

On page 194 our readers will find an advertising section, giving the local address and telephone number of manufacturers' agents and branch offices of out of town concerns. The constant inquiries coming to the Electrical Record for this information caused this section to be started. It will be found especially useful by persons wanting immediate information. As a time saver it will be appreciated.

Guelson & Wathe, manufacturers of Monarch vacuum cleaners, 203 West 5th street, Mason City, Ia., are looking for United States and Canadian agents to handle their wares. Prospective agents should communicate by mail at once, to take advantage of the active spring trade in house cleaning devices.

W. H. Beaven, Jefferson County Bank Bldg., Birmingham, Ala., wishes to get into communication with some concerns manufacturing cotton and silk covered magnet wire and silk covered lamp cord who are looking for a Southern representative or agent. Mr. Beaven has recently entered the electrical field as a manufacturers' sales agent.

T. M. Schollenberger, manufacturers' agent at 5 North Wabash avenue, Chicago, is open for engagement as agent for a line of lighting specialties, such as chains and other fittings.

The Great West Sales Company, 312 Boyd Building, Winnipeg, Canada, offers the services of a live selling organization, together with intelligent aid in the matter of credits and collections, and is open to represent manufacturers of electrical lines who are desirous of high class representation in Western Canada.

The Greenfield Tap & Die Corporation, of Greenfield, Mass., has made the following changes in its New York, Philadelphia, and Chicago stores: the corporation maintains now one store only in New York, which is located at 28 Warren street, the former location of the Wiley & Russell store. The Wells Brothers Co.'s store, at 107 Lafayette street, has been discontinued. In Chicago, the Wiley & Russell store at 545 West Washington boulevard, has been discontinued, and the stores consolidated at 13 South Clinton street, the former location of Wells Bros. Co.'s store. At both of these stores, as well as at 38 North Sixth street, Philadelphia, a complete stock of Wells Bros.', Wiley & Russell Mfg. Co.'s, and A. J. Smart Mfg. Co.'s goods are carried. The consolidation of the stores in this manner makes an improvement in the service offered by the different companies. Each of the stores has its same management as formerly.

The Specialty Sales Co., 1331 Fourth avenue, Seattle, Wash., wishes to act as representative of electrical manufacturers on a commission basis for the states of Washington and Oregon, or the entire Pacific Coast. In addition to the usual line of electrical goods, this concern is also in the market for the exclusive handling of a high grade vacuum cleaner in that territory.

George W. Russell, 86 Chope place, Detroit, Mich., who is well acquainted with the electrical trade throughout Michigan, wishes to represent manufacturers of electrical merchandise. For the past four years he has been representing a New York concern and previous to that spent eight years in the electrical contracting business.

J. J. Dunn, who represents the Eagle Glass & Mfg. Co., at 161 Summer street, Boston, Mass., has recently taken larger quarters in which to show the various lines he is carrying.

The Adams-Bagnall Electric Co., Cleveland, Ohio, announces the opening of a sales office at 417 South Dearborn street, Chicago, Ill. This office will be in charge of Van N. Marker, who has long been identified with the company in the Northwestern territory.

The United States Glass Co., which has lately started the manufacture of shades for fixtures, has assigned the New England territory to John J. Reed & Son, who have offices at 220 Devonshire street, Boston, Mass.

Fred W. Godfrey, formerly with Nagel & Co., of Toledo, Ohio, and also with the Bryan-Marsh Co., has taken a position as sales representative in the eastern part of the country with the Best Electric Co., of Pittsburgh, Pa. Mr. Godfrey is looking after the sales of the Best Electric Co. in New York, Eastern Pennsylvania, New Jersey, Delaware, Maryland, and Virginia.

The American Manufacturers' Agency, Inc., 111 Dearborn street, Chicago, William H. McKinlock, president, has taken the agency for the Union Electric Co.'s line of sockets, switches, and attachment plugs.

The Sprague Electric Works of General Electric Co. has recently opened a branch sales office in Cleveland, Ohio. It will be in charge of Frank H. Hill, manager, who also has charge of the Pittsburgh office. The Cleveland office will be located in the Illuminating Building.

Charles W. Yerger has recently been placed in charge of the Cincinnati office of The Cutler-Hammer Mfg. Co., of Milwaukee. This office located in the Gwynne Building, has been in charge of Horace L. Dawson, who has now become district sales manager with headquarters in Chicago. Mr. Yerger entered the employ of The Cutler-Hammer Mfg. Co. in 1908, after graduating from the electrical engineering course at Ohio State University.

The Interstate Electric Novelty Co., 29 Park place, New York, has branches offices at 541 Washington boulevard, Chicago; 111 New Montgomery street, San Francisco; 220 King street, West, Toronto, Canada.

The Bailey Reflector Co., of Pittsburgh, Pa., has opened an office in 1314-1315 Williamson Building, Cleveland, Ohio, under the management of H. L. Town. Mr. Town also represents the Friedley-Voshardt Co. of Chicago, Ill., in the Central States. Should any manufacturer of high class illuminating lines desire close and careful representation in Ohio, this office is in a position to devote the necessary time for such attention. A high class lamp line is solicited.

The Terry Steam Turbine Co., of Hartford, Conn., has put A. W. de Revere in charge of its Chicago office, located in the Peoples Gas Building. A branch office has been opened in the Michigan Trust Building, Grand Rapids, Mich., with A. L. Searles in charge.

W. F. Hurlburt, formerly New Haven manager for the Crocker-Wheeler Co., is now in charge of the motor starting department of Walker Brothers & Haviland, 50 Church street, New York. Walker Brothers & Haviland have been appointed general sales agent by the Industrial Controller Co., of Milwaukee, Wis.

Horace L. Dawson, formerly of the Chicago and Cincinnati offices of The Cutler-Hammer Mfg. Co., of Milwaukee, is now district sales manager for the Chicago territory. Mr. Dawson began work with The Cutler-Hammer Mfg. Co. in 1907. After completing the apprentice shop course he spent two years in the engineering department of the company and then joined the sales-engineering force of the Chicago office. When the Cincinnati office in the Fourth National Bank Building was established in 1913, Mr. Dawson was put in charge and in the course of one year's time succeeded in increasing the volume of business from that territory materially, making it necessary to move to larger quarters in the Gwynne Building. Mr. Dawson is a graduate of Cornell University, class of 1907.

JOBBERS AND DEALERS

The Electrical Supply Jobbers' Association held a meeting at the Hotel La Salle, Chicago, Ill., March 17-19, 1915. The executive committee of fifteen members was re-elected, and the other committees continued intact. N. G. Harvey, of the Illinois Electric Co., Chicago, was elected chairman of the Central division, and F. S. Price, of Pettingell-Andrews Co., Boston, chairman of the Atlantic division. Franklin Overbaugh, Chicago, was re-elected general secretary. On the second day the jobbers had a joint meeting with the electrical manufacturers. An executive session was held on the morning of the third day, the afternoon being taken up with a visit to the Hawthorne Works of the Western Electric Co. A number of topics were discussed, among them being the philosophy and ethics of the industry. Most of the meetings were held behind closed doors. About 100 jobbers and jobbers' representatives were present.

W. R. Ostrander & Co., 22 Dey street, New York, were the successful bidders for the largest single order of electro-mechanical gongs ever installed in an office building in this country. These bells, 82 in number, were installed two on each floor of the new Equitable Building in New York. The order was placed through the biggest fire alarm company in New York.

Chas. W. Leveridge, jobber of electrical supplies, formerly at 183 Greenwich street, New York, removed to larger quarters at 133 Liberty street, New York, on April 1.

The Philadelphia Electric Co. Supply Department, 132 South 11 street, Philadelphia, Pa., electrical jobber, is handling a complete line of potheads, known by the trade name of "Franklin." These potheads are said to be winning a well merited success on a record devoid of failure.

PERSONAL

Jim O. Corbett has joined the sales force of the Best Electric Co., of Pittsburgh, Pa. Mr. Corbett was connected with the Economy Fuse & Mfg. Co. for a long time and is well known through the Middle West. In his new position Mr. Corbett will travel Western Pennsylvania, Ohio, West Virginia, Kentucky, Indiana and Tennessee, selling "Best" sockets, attachment plugs, and sign receptacles.

J. J. Carty, chief engineer of the American Telephone & Telegraph Co., has been nominated for president of the American Institute of Electrical Engineers. As he is the directors' nominee, and the only nominee, the nomination is equivalent to an election. He will be the first telephone man to occupy this office since the election of Alexander Graham Bell in 1891.

William Siebenmorgan, formerly chief engineer of the C. & C. Electric & Mfg. Co., of Garwood, N. J., recently resigned his position with that company.

Clifford E. Parkhurst has joined The Enterprise Electric Fixture Co., of Cleveland, Ohio, as manager-designer. He will have charge of designing the fixtures made by this company.

O. L. Remington, general manager, and H. P. McColl, engineer, of William McLean & Co., 115 Elizabeth street, Melbourne, Australia, will arrive in San Francisco on the S. S. *Sonoma* on April 1, will spend two or three days on the Pacific Coast and then go to Chicago and St. Louis. These men are making an extensive study of a few lines in the electrical field, and will visit all the principal American electrical industrial centres in the central and eastern states. They invite correspondence from American business concerns who feel that mutual interests would urge these two men to make a visit to their works. Letters to this effect addressed to O. L. Remington, Planters Hotel, St Louis; Hotel La Salle, Chicago; Gibson House, Cincinnati; Hotel Statler, Cleveland, and Hotel Astor, New York, will be held pending arrival. If war conditions permit, Mr. Remington will visit England and Holland for a few weeks and then return to Australia, via New York, the central states, and San Francisco, in July.

W. D. Ray, who for the last five years has been executive manager of the Northern Indiana Gas & Electric Light Co. properties in Hammond, East Chicago, Whiting, and other towns in that part of Indiana, has resigned his position, effective May 1. He has accepted a more responsible position with the Atlantic Gas & Electric properties of the General Gas & Electric Co. at Easton, Pa. During Mr. Ray's term as manager the properties of the Northern Indiana Gas & Electric Co. were restored from an indifferent condition to one of the best operated public utilities in the country.

OBITUARY

John P. Bodine, vice-president of the Bodine Electric Co., 564 West Randolph street, Chicago, died Feb. 25 at the age of fifty-six years. Mr. Bodine was associated in business with his two sons.

E. G. Bernard, president of the Bernard Electric Co. of Troy, N. Y., died suddenly at Troy on February 23. Mr. Bernard was one of the best known electrical jobbers in the electrical field. For some years he was a prominent electrical contractor. During the Spanish-American war he had a contract with the Navy Department for the wiring of a number of battleships and cruisers, and for years he controlled some of the best up state wiring contracts.

James M. Gardiner, who for the last 50 years has been associated with the Gamewell Fire Alarm Telegraph Co. of New York, died at his residence in New York on February 25. He was born in Scotland in 1819, ninety-six years ago. The results of his mechanical and inventive genius have proved an important factor in the protection of life and property through the fire-alarm telegraph service. The first practical non-interfering fire-alarm box was a product of his genius, and for a generation the "Gardiner" fire-alarm box was almost exclusively used throughout the United States.

N. L. Bradley, of the Bradley & Hubbard Mfg. Co., Meriden, Conn., died at his home on March 17, 1915.

Frederick W. Taylor, the originator and chief exponent of the modern scientific management movement, died of pneumonia at Philadelphia, Pa., on Sunday, March 21. The recent reorganization on a scientific basis of many of the large industrial concerns in this country was due to the efforts of Mr. Taylor as an efficiency expert. One of his leading doctrines, which has made a deep impression on business and industry in this country recently is that a man who proves incompetent at one job should be fitted in where he can give good service, instead of being fired. Mr. Taylor's work was chiefly devoted to the simplification of industrial processes to reduce costs and increase outputs. Some of the big shops into which he introduced his theories of scientific management are the Bethlehem Steel Co., Cramp's Shipbuilding Co., and the Midvale Steel Co.

For his invention of the Taylor-White process of treating modern high-speed tools he received a gold medal from the Paris Exposition of 1900. He had received about 100 patents for various inventions, many of which are in general use.

He was president of the American Society of Mechanical Engineers in 1905 and 1906. He was the author of technical books and articles, but is best known by "The Principles of Scientific Management" and "Shop Management," both published in 1911.

ASSOCIATIONS AND SOCIETIES

A meeting of the board of directors of the American Institute of Electrical Engineers was held at 29 West 39th street, New York, on Friday, March 12, 1915. The executive committee's recommendation that the convention be held at Deer Park, Maryland, June 29-July 2, 1915, was approved by the board. Following the report of the committee of tellers on the ballots cast for officers, the board of directors made the following nominations: for president, John J. Carty, New York; for vice-presidents, Comfort A. Adams, Cambridge, Mass., J. Franklin Stevens, Philadelphia, Pa., and William McClellan, New York; for managers, John B. Taylor, Schenectady, N. Y.; C. E. Skinner, Pittsburgh, Pa.; F. B. Jewett, New York; Harold Pender, Philadelphia, Pa.; for treasurer, George A. Hamilton, Elizabeth, N. J.

The eleventh annual convention of The Southwestern Electrical & Gas Association will be held at Dallas on May 19-22, 1914. A programme of papers to be read and social diversions will be published next month. Inquiries regarding this convention should be sent to H. S. Cooper, secretary, 405 Slaughter Building, Dallas, Texas.

The American Museum of Safety, formerly located at 29 West 39th street, New York, has removed to 18 West 24th street. All visitors are welcome.

The 1915 convention of the Illuminating Engineering Society will be held in Washington, D. C., probably during the fourth week of September. E. S. Marlow, manager of the commercial department of the Potomac Electric Co., is chairman of the convention committee. In reporting for the Pittsburgh Section of this society, S. G. Hibben stated that the section had instituted a campaign to popularize good lighting through public education. In conjunction with the committee on school lighting a meeting was arranged recently in the Addison School in Cleveland, Ohio, which was attended by teachers and school authorities. The subject of the meeting was "Safeguarding the Eyesight of School Children."

W. G. Gove and L. C. Porter presented a paper on car lighting problems at a meeting of the New York section of the Illuminating Engineering Society on March 11.

An 18-page pamphlet containing data on the use of the electric vehicle in parcel post service has been compiled and printed by the parcel post delivery committee of the Electric Vehicle Association.

The St. Louis Jovian League is a live organization. It meets for luncheon every Tuesday at 12:15 at the American Annex. F. D. Beardslee, of the Union Electric Light & Power Co., is president; Fred Johnson, of the Wagner Electric Mfg. Co., is vice-president; F. D. Phillips, of the Wesco Supply Co., is secretary and treasurer.

T. C. Martin gave an address on "Electrical Aspects and Lessons of the San Francisco Exposition" at a meeting of the New York Electrical Society at 29 West 39th street, New York, on March 25.

A joint meeting of the Pittsburgh sections of the I. E. S. and the A. I. E. E. was held in the Engineers' Society auditorium, 2511 Oliver Building, Pittsburgh, on March 9. E. R. Meyer, physical examiner of the Westinghouse Lamp Co., read a paper on "The Manufacture of New Types of Mazda Lamps."

Toronto, Canada, will hold an electrical show, April 12-17.

A joint meeting of the American Institute of Electrical Engineers and the New York Section of the American Electrochemical Society was held in New York on March 12. Two papers were presented: "Fixation of Atmospheric Nitrogen," by Leland L. Summers, and "The Cyanamide Process," by Frank B. Washburn.

The seventh semi-annual meeting of the American Institute of Chemical Engineers will be held in San Francisco, Cal., August 25 to 28. An itinerary is being arranged so that the interesting natural scenery of the West may be seen and also some of the more important mining operations as well as the typical chemical industries of California.

Annual convention N. E. L. A., San Francisco, June 7-11.

Annual convention A. I. E. E., Deer Park, Md., June 29-July 2.

Annual convention I. E. S., Washington, D. C., September.

Annual convention I. C. E., San Francisco, August 25-28.

The fifth meeting of the National Joint Committee on Overhead and Underground Line Construction was held on Wednesday, February 24, in the rooms of the American Institute of Electrical Engineers, at No. 29 West 39th street, New York. The committee devoted practically all day to continuing the work of revising the present power wire-crossing specifications, and dividing the work up into sections to be apportioned to various sub-committees for revision. The committee would greatly appreciate advice as to desirable requirements, and also detail criticism of any of the clauses of the present standard power wire-crossing specifications.

A meeting of the public policy committee of the National Electric Light Association was held at the headquarters in New York on March 11. Mr. Hale reported on the work of his committee on concentric wiring. The matter was discussed at length, and it was the sense of the committee that while it is wise to reduce the cost of wiring as rapidly as practicable, especially as applied to old buildings, great care should be exercised to avoid any lowering of reasonable standards of safety.

At a meeting of the New York Jovian League held March 17, at Hotel Martinique, it was unanimously voted to support Assembly Bill No. 1338, introduced by John R. Powers, in relation to the registration of master electricians. Believing that this bill will aid materially in standardizing and improving electrical conditions and will be a benefit to all branches of the trade, the League is urging its members and friends to urge its prompt passage.

ELECTRICAL DEVELOPMENT SOCIETY

The society has recently distributed a booklet entitled "101 Successful Selling Suggestions." Copies of this book have been sent to all the members of the society. Copies in quantity will be delivered to members desiring same at the cost price of 8 cents each.

Last month the Society sent out a circular containing illustrated items on decorating show windows for St. Patrick's Day and Easter Sunday. In displays of the first kind interest was centered in green shamrocks and harps; in the latter, as usual, interest was centered in the proverbial rabbit and egg.

Thirty prominent salesmen and publicity managers met at the offices of the society on March 4. The meeting was held for the purpose of carrying out the decision of the society's executive committee to ask leading commercial men to select a steering committee to handle "National Electric Prosperity Week." There was some discussion as to the proper time for such a week, whether for this fall or in the spring of 1916. The concensus of opinion was that while perhaps a year might well be taken to get the maximum efficiency, yet the industry needed a revival now and that this fall would undoubtedly be the best time, considering all conditions. It was decided to leave the matter to analysis by the steering committee and it is expected that a definite date will soon be fixed. The selection of a steering committee to handle the arrangements for the week was the next matter taken up. It was decided that the chairman, E. W. Lloyd, and the general manager of the Society, J. M. Wakeman, should select a nominating committee of five men representing the varied interests. They will in turn select the 25 men who will represent the central stations, manufacturers, jobbers, contractors, dealers and technical press. One man from each interest will be named as chairman of his division.

Five hundred electrical men of Philadelphia attended a "get-together" meeting at the Hotel Adelphia roof garden, March 5. The meeting was held under the auspices of the commercial branch of the Philadelphia Electric Co. Section of the National Electric Light Association. Invitations were sent to the Society for Electrical Development to have staff men present to deliver addresses, and four of its staff responded. In this way the meeting became a cooperative meeting for the society. The affair was a success from every point of view, the Philadelphia contractors, two hundred sixty-eight being present, dealers and central station employees learning more about the work of the society, and at the same time having an enjoyable evening.

FOREIGN TRADE OPPORTUNITIES

The Bureau of Foreign and Domestic Commerce maintains branch offices in eight commercial centers, where business men may more readily avail themselves of the service of the Bureau. Reserved addresses in connection with "Foreign trade opportunities" and all lists of names offered in connection with articles published in Commerce Reports may be obtained from the nearest office by application in letter form. The list of offices follow: New York, 409 United States Customhouse: Chicago, 629 Federal Building: New Orleans, 1020 Hibernia Bank Building; San Francisco, 410 United States Customhouse; Atlanta, 52 Post Office Building; Seattle, 922 Alaska Building: Boston, 752 Oliver Building; St. Louis, 402 Third National Bank Building.

No. 15824.—Telephone and Telegraph Wire. Flour and Grain, Etc.—An American consul in Europe reports that an agent in his district desires immediate quotations f. o. b. steamer, on telephone and telegraph wire. It is stated that the Government is preparing to expend $134,000 for this commodity. Correspondence may be in English. He also desires to represent American exporters of shoemakers' tools, crude rubber, gutta percha, hides, leather, oils, flour, grain, steel, copper, shoes, and rubber shoes. Terms, cash against documents.

No. 15826. Searchlights—An American consular officer in one of the neutral European countries reports that a business man in his district desires American manufacturers and exporters to quote, at once, prices f. o. b. New York, on searchlights for field service and fortifications, in all sizes. Correspondence may be in English.

No. 15892. Wireless Plants.—An American consular officer in Latin America reports that the Government is contemplating the erection of wireless stations, and that full information is desired relatively to the apparatus, supplies, etc., and installation of complete wireless plants. Correspondence, etc., should be in the Spanish language.

No. 16002. Electric-light Globes.—An American consular officer in southern Europe reports that an importing firm in his district desires to secure an exclusive agency for the sale of American drawn wire electric-light globes. The globes should be one-half and one watt per candle. Correspondence should be in Italian or French. C. i. f. quotation in French or Italian currency should be submitted at once. Illustrated literature may be examined at the bureau and its branch offices.

No. 15749. WIRELESS APPARATUS—A business man in Central America has informed one of the commercial agents of the Bureau of Foreign and Domestic Commerce that he is negotiating with one of the Governments of Latin America for the installation of a wireless station. He wishes to receive offers, catalogues, prices, etc., from American manufacturers of wireless apparatus. It is desired to install a plant capable of communicating from 1,500 to 2,000 miles. He also desires an estimate on the installation of the equipment.

No. 15699. ELECTRIC MOTOR—An American consular officer in a Mediterranean Sea city reports that a local electric light company has requested him to secure full particulars, specifications, weights and measurements, price, c. i. f. destination, etc., for a 100-horsepower electric motor. Possible date of delivery should also be stated.

No. 15684. ELECTRIC LAMPS, STATIONARY, ETC.—An American business firm in New York has informed the Bureau of Foreign and Domestic Commerce that a representative of a group of Russian capitalists, who are interested in the exchange of commodities between Russia and the United States, wishes to communicate with American firms dealing in electric lamps, commercial stationery, and aniline dyestuffs. He also wishes to form commercial relations with American firms which may be interested in importing Russian products.

No. 15802. ELECTRICAL SUPPLIES—One of the commercial attaches of the Department of Commerce reports that an electrical company desires to be placed in communication with American manufacturers of electrical supplies with a view to representing them in the foreign country. Reference is given.

No. 15865. MAGNETOS.—A firm of pump specialists in Europe has informed an American consul that it desires to get in communication with American manufacturers of high-tension magnetos for single-cylinder gasoline engines of 1 to 6 horsepower. A sample machine is desired for inspection. Full particulars, prices, conditions of payment, etc., should be sent at once. It is stated that cash will not be paid in advance. The firm states that if the terms, etc., are satisfactory an order for 50 magnetos will be made at once, with possible supplementary orders during the year totaling about 200.

No. 15844. ELECTRIC DEVICE FOR FELLING TREES.—An American consul in Africa reports that a man in his district wishes to secure an agency for the sale of an electrical device for felling trees.

No. 15868. ELECTRIC CRANES.—An American consular officer in Africa has transmitted plans, specifications, etc., relative an opportunity for American firms to bid on supplying seven 5-ton and one 10-ton electric cranes for a port in his district. Bids will be opened about April 30, 1915. The consul also forwards the names of firms which may be in a position to represent American manufacturers if such arrangement is desired. The plans, specifications, etc., may be examined at the Bureau of Foreign and Domestic Commerce and its branch offices.

No. 15872. ELECTROTYPING AND PHOTOLITHOGRAPHING MACHINERY.—The commercial agent of the Bureau of Foreign and Domestic Commerce in New York City reports that there seems to be an opportunity for American manufacturers of electrotyping and photolithographing machinery to secure an order from one of the Latin American Governments. The matter may be taken up with a business man in New York City.

The Woodland Works, Wick Lane, Old Ford Road, Bow, London, E., England, is in the market for the following equipment. High speed braiding machines for covering electric wire and cables; lead-covering machinery; rubber mixing and calendering machinery; cable maker's testing equipment, and vulcanizing plant. American manufacturers who are in a position to make prompt deliveries of such equipment are requested to communicate with Geo. A. Fuller, managing director of the Woodland Works.

No. 15850. GAS AND ELECTRIC FIXTURES, SUPPLIES, ETC.—An American consular officer in South America reports that a firm in his district, which operates gas and electric light plants, is desirous of communicating with American dealers and manufacturers of gas and electric fixtures, electrical apparatus, including stoves and toys, supplies, and machinery. Catalogues and correspondence may be in English, but Spanish is preferred.

No. 15776. ELECTRICAL MACHINERY.—One of the commercial agents of the Bureau of Foreign and Domestic Commerce in South America reports that the management of a cotton mill informs him that it is desired to electrify the entire mill. It is stated that plans, drawings, etc., of a modern oil-engine plant should be submitted. It is explained that it will require about 40 motors from 4 to 20 horsepower each. Correspondence may be in English.

No. 15793. ELECTRIC RAILWAY SIGNAL SYSTEM.—The Bureau of Foreign and Domestic Commerce is advised by one of its commercial agents that a railway and power company in Latin America desires to get into communication with American firms which may be in a position to supply electric railway signal apparatus. Catalogues and prices, etc., should be sent at once. Correspondence should be conducted in English.

No. 15991. ELECTRICAL AND PLUMBING SUPPLIES, FIRE ENGINES, ETC.—An American consul in Russia has received a communication from a railway engineer stating that he desires to get in touch with American manufacturers of electrical and plumbing supplies, pumps, boilers, road-making machinery, fire engines, and extinguishers, stump-pullers, and material for municipal laundries, and bathing houses. Correspondence may be in English.

PUBLIC SERVICE NOTES

The New York *Evening Post* has just issued its "Second Annual Public Utilities Number." This supplement contains complete data on all the public utilities in the United States, also descriptive particulars about many of the better known utilities.

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The electric output for the first two months of this year of the Interstate Light and Power Co., a subsidiary of Northern States Power Co., as compared with the first two months of 1914 showed an increase of 24 per cent. This company serves the Illinois-Wisconsin zinc mining district with power. The largely increased mining operations account for the gain in output of power.

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The Pacific Gas and Electric Co. reports for January, 1915, gross revenue of $1,694,310, an increase of $101,563, or 6.3 per cent. Operating expenses and taxes were higher by only $251, with net revenue of $910,204, a gain of $101,815, or 12.6 per cent. over January, 1914. Interest charges were lower by 1.2 per cent., and there was a balance for the month of $556,555, an expansion of $106,354, or 23.6 per cent. For the calendar year of 1914 gross earnings of the company aggregated $17,220,503, an improvement of $1,018,166, or 6.2 per cent., while net revenue was $8,306,582, or 20.8 per cent. above 1913. The balance for the year after interest charges was $4,115,180, an increase of $1,146,094, or 38.6 per cent.

PUBLIC UTILITY RULINGS

CALIFORNIA

Pacific Gas & Electric Co., desiring to establish a special contract rate to a limited number of consumers located near Penryn, Cal., applied for permission to enter into a contract with such consumers whereby it should construct a 2,200-volt transmission line to a prescribed point, install the necessary transformers, etc. the consumers to agree to construct the balance of lines necessary to points of consumption and to the payment of a yearly minimum of $442. The application was granted. In connection with this authorization the commission announced that the schedules of rates as effective for various classes of utilities are established to cover average conditions; that a utility cannot expect to eliminate all unprofitable consumers, the burden of such consumers to be carried by the excessively profitable ones; and that if a utility desires to eliminate all unprofitable consumers, a revision of rates will be necessary to compensate for the reduced cost of service.

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A telephone company operating in the city of Santa Barbara and adjacent territory alleged that the rates of another telephone company operating there were discriminatory and unduly low, and so established by the defendant for competitive purposes with a view to forcing the complainant out of business. The defendant, while admitting that its rates in this territory were not compensatory, contended that the commission had no jurisdiction to grant the relief prayed for. It was held that the commission had no jurisdiction over the matters complained of because: (1) the city of Santa Barbara had not transferred, by special election, control of its utilities to the commission, and the commission accordingly had no jurisdiction over rates within the city limits; (2) to eliminate the discrimination complained of would necessitate either an order directing an increase in the lower rate or a decrease in the higher rate, which order the commission is powerless to make for the reasons stated above; furthermore, section 60 of the California Public Utilities Act does not provide that one utility may bring into question the rates of a like utility, especially when such complainant is not even in the position of a patron of the utility complained of. The complaint was accordingly dismissed, without prejudice to its renewal by proper parties, if the commission shall, in the future, be empowered with the necessary jurisdiction within the city limits of Santa Barbara.—Home T. & T. Co. of Santa Barbara v. Pacific T. & T. Co.

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Complainants, desiring electric service and not being willing to accept such service under the conditions proposed by the defendant company or in accordance with suggestions made by electrical engineers of the commission, filed a formal complaint petitioning the commission to compel the defendant to extend its lines and deliver electric energy at the regular rates for such service. It was held that, considering the cost of necessary extensions and transformers and the probable revenues to be derived from the complainants, it would be unfair to expect the defendant to extend service entirely at its own expense. Proper apportionment of expenses was outlined and the defendant directed to extend its portion of such service, provided the complainants agreed to pay their share of the cost of such necessary extensions.—C. E. Warren and H. Pash v. Pacific Gas & Electric Co.

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WISCONSIN

The commission holds that cost of service is never the sole consideration in determining the reasonableness of a charge. It is one of the primary considerations, but there are other considerations often as vital in reaching a conclusion. The commission considers that a charge which would result in taking business from one company and giving it to its competitor could not be regarded as a just charge from any viewpoint.—McGowan v. Rock County T. Co.

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Complaint was made that the lighting service rendered by the Illinois Northern Utilities Co. at Walworth, Wis., and Fontana, Wis., was inadequate for the reason that current was furnished only from 7 a. m. to 12 p. m.; that there was need for a more extended service; and that the company was not fully complying with the standards of electric service fixed by the commission in its order of August 9, 1913, 12 W. R. C. 418. The company opposed continuous service on the ground of unwarranted cost. It appeared that the period of operation could be somewhat extended without entailing serious additional cost. It was ordered that the company extend its period of service for its patrons here involved so that lighting service will be rendered between 5 a. m. and 12 midnight. The company was also ordered to comply with the general order of the commission fixing standards and rules for electric service.—Filber v. Illinois Northern Utilities Co.

INQUIRIES

Inquiries which we have been unable to answer have been received for the names and addresses of manufacturers of the articles listed below.

Replies from our readers to any or all of these are cordially welcomed both for publication here, and for incorporation as well in our Classified Index of Manufacturers.

In the interests of the good services which this department is expected to render, we would impress upon correspondents the advisability of making their inquiries as specific as possible. This will help materially in obtaining the desired information.

"ABC" National auto horn.
"New Easy" gas burner.
"Eddy" telephone receiver cord.
"Peerless" expansion bolt.
"Red-y" wire solder.
"Franklin" arc lamp.
"Vita" electric cooking apparatus.
"No Kair" electric stove.
"Zwicke" insulated wire.
"Bohler" magneto.
"Parmot" moulding.
"Severn" gasoline engine.
Address of Try Fireless Cooker Co.
"Eureka" porcelain knob.
"Radio" electric hair waver.
"Utility" lantern.
"Rohne" electric heating pad.
"Emco" gauge tester.
"Bedell" sad iron.
"Tugan" resistance wire.
"Acme" reflector tungsten lamp.
Address of Waldo Mfg. Co.
"Climax" flat iron, asked for in March issue, is made by Reliance Elec. Htg. Co., Columbia, Pa.

NEW BOOKS

Elementary Electricity and Magnetism
Advanced Electricity and Magnetism

Electricity and Magnetism. Two books. By Wm. S. Franklin and Barry MacNutt. Price $1.25 and $2.00, respectively. Published by The Macmillan Co., New York.

Once in a great while we come across a writer of elementary text books who turns out original stuff instead of the usual pastepot and shears hodgepodge; a writer who has something to say, knows how to say it, says it, and then stops. Text books of this kind are rare, because their writing involves hard work and plenty of it. It is easier and cheaper to clip and paste. The real text book author must have a clear head, discernment, judgment, and, most of all, a sense of proportion. He must possess humor, likewise, so as not to take himself too seriously. His sense of proportion will tell him not to bury salient facts under a mass of useless detail in an elementary work. To be of use, an elementary text book must present the elements clearly and briefly, and then stop. Most text book compilers burden the elements, the skeleton, with so much flesh and fustian that the seeker for essential ground facts first gets muddled, then discouraged, and finally gives up the subject and goes out for a walk. There are a couple of pedagogues down in South Bethlehem, Pa., who know how to write elementary text books—they know what to put in, and, what is even more important, what to leave out. They have just written two new text books on electricity and magnetism that are original, clear, and well balanced. The most remarkable thing about these text books is that they actually stick to their text. They don't pretend to tell what electricity is, though, leaving that job to those who deal in the great science of words. Both books are copiously illustrated with good cuts. Both are useful to the fellow who wants to find out things of this sort and is willing to work his head a bit to get the "dope." Here then is electricity and magnetism in two volumes; one small, the other somewhat larger. The small one contains 174 pages and 152 cuts, and is entitled "Elementary Electricity and Magnetism"; the larger one has 300 pages, 217 cuts, and is entitled, "Advanced Electricity and Magnetism." In introducing the smaller book the authors urge the reader to play at the sciences instead of taking them as a mental scourge. The character of the treatment in the bigger book has been, they say, determined by the desire to keep the reader's mind jammed up tight against physical things. The bigger book is for the study table; the smaller one should be in the pocket of every electrical student and artisan.

Calculus

By Wm. S. Franklin, Barry MacNutt, and Roland L. Charles. 253 pages with 38 pages of appendices. Published by the authors, South Bethlehem, Pa.

Years ago a talented New England author, Lord Timothy Dexter, self-knighted, published a pamphlet with the punctuation omitted. He omitted it from the text, he said, because no two people could agree on the proper placing of punctuation points. He grouped an assortment of points in the back of the pamphlet, telling the reader he would find them there and that he could "peper and solt as you plese." Mark Twain did a similar thing in one of his books. He said that all sorts of weather had been amply and ably expounded, and he thought it best therefore not to break the thread of a story by inserting paragraphs relating to meteorological conditions. In the back of the book he published weather quotations from various authors, telling his readers that whenever they felt weather hungry they could turn to the extracts and read one or more of them, according to mood. This plan of dropping the bothereres into a hell hole seems to have become fashionable. These authors have done the same thing in this text book on calculus—the greater portion of formal problems are contained in an appendix, where they retain their characteristic feature of looking like an explosion in a type foundry. The preceding 253 pages of text take the ambitious reader gently by the hand and lead him through eight entertaining chapters that start on a general survey of differential and integral calculus and end at the partial differential equation of wave motion. Between these mathematical elysian fields the reader is shown both analytically and graphically how to differentiate and integrate, and how to apply calculus to practical problems. Having been out of college full twenty years, we find the text somewhat beyond our ken, but we are willing to believe with Abe Lincoln that this book is saturated with just the sort of thing a person would like who likes that sort of thing. An army officer who has read it says that in it the charm of fiction is blended with the merit of fact. No doubt this is so, for if anyone on earth can make calculus as entertaining as baseball or war news, that person is Wm. S. Franklin of South Bethlehem, Pa.

CONSULTING ENGINEERS

E. J. Andrews has moved his office from room 1515 Monadnock Block, Chicago, to room 539 Monadnock Block, where he will continue to specialize in electrical and mechanical engineering patents and patent causes.

Cole, Ives, and Davidson is a new firm of consulting engineers made up of William W. Cole, formerly of 43 Exchange place, New York City, and Ives and Davidson, of 61 Broadway. The offices of the new organization are at 61 Broadway, New York. Special attention will be given to investigations and reports for financial interests, inventories and valuations of public utility or industrial properties and design or management of power plants of all descriptions.

NAVY DEPARTMENT BIDS WANTED

The Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will open bids in the city of Washington on the date specified for the electrical supplies listed below.

Those who wish to submit bids should fill in the special application blanks, which are furnished by the Bureau on request, and should fill in these blanks with the numbers given in the "Sch." column in the list below on which they want to bid.

After having been properly filled out, these blanks should be mailed to the Bureau without delay.

The specifications will then be forwarded, or as soon as they are received from the Public Printer.

These specifications, or schedules, as they are officially called, may be obtained also by applying in the same way to the Navy Pay Office nearest each of the Navy Yards mentioned.

OPENING APRIL 13, 1915

Article.	Quantity.	Delivery at Navy Yard.	Sch.
Ammeters and voltmeters	Miscellaneous	Brooklyn, N. Y.	8067
Annunciators, W. T. type	10	Charleston, S. C.	8067
Bells and buzzers, vibrating	Miscellaneous	East and West	8067
Bushings, hard rubber	do	East	8067
Buttons, Push	do	East and West	8067
Fibre, sheet, red and gray	do	do	8067
Fittings, electrical	do	do	8067
Fittings, interior	do	East	8067
Fuses, glass tube	do	East and West	8067
Fuses, inclosed cartridge type	do	do	8067
Fuses, renewable	do	Philadelphia, Norfolk	8067
Globes and reflectors	do	Mare Island, Cal.	8067
Guards, portable, N. W. T.	do	East and West	8067
Holders, shade	100	Mare Island, Cal.	8067
Irons, flat, electric	Miscellaneous	East and West	8067
Irons, soldering, electric	do	East	8067
Material for switchboard panels	do	Brooklyn, N. Y.	8067
Mica, plate, pressed	do	East and West	8067
Rubber, sheet, hard	do	do	8067
Sets, ventilating, portable	do	do	8067
Sockets, lamp	do	East	8067
Switches, single and three pole	do	do	8067
Tape, linen, etc., electric	do	do	8067
Tubes, terminal	do	Charleston, Philadelphia	8067
Wire, fuse	do	Brooklyn, Charleston	8067
Wire, Magnet	do	Boston, Mare Island	8067
Wire, resistance	do	Mare Island, Cal.	8067
Wire, solder, rosin cored	do	Charleston, S. C.	8067

NEW CATALOGUES

Ideal Elec. & Mfg. Co., Mansfield, Ohio.
Bulletins Nos. 1012-1015. Type D direct current motors and dynamos.
Bulletins Nos. 1033-1035. Type A squirrel cage induction motors.
Bulletins Nos. 1043-1044. Type AV slip ring induction motors.
Bulletins Nos. 1052-1053. Type F revolving field belted alternators.
Bulletin No. 1231. Battery of induction motors.
Bulletin No. 1232. Motors applied to centrifugal pumps.
Bulletin No. 1233. Direct current generators.
Bulletin No. 1234. Elevator motors.

Lauson-Lawton Co., De Pere, Wis.
Booklet. Electric Lighting plants for country homes, 32 pages.

E. S. Lincoln, Inc., Waltham, Mass.
Booklet. Purpose of the laboratories.

Jewell Electric Co., Chicago, Ill.
Bulletin No. 800. Detachable electric rowboat motor.

Pass & Seymour, Inc., Solvay, N. Y.
Leaflets. Additional pages for catalogue.

Reliance Instrument Co., Chicago, Ill.
Bulletin No. 15. Meters, 30 pages.

St. Louis Malleable Casting Co., St. Louis, Mo.
Booklet. Information for salesmen.

Combustion Engineering Corporation, New York.
Bulletin B-2. Type E stoker, 20 pages.

Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.
Catalogue Section DS846. Pole line hardware, 20 pages.
Leaflet No. 2482-A. Wheel lathe equipments.

DeLaval Steam Turbine Co., Trenton, N. J.
Booklet. Steam turbine drive for steel mills, 22 pages.

Paasche Air Brush Co., Chicago, Ill.
Booklet. Air brushes, 12 pages.

Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Bulletin No. 13,000. Magnetic separator pulleys.
Folder. Inquiry and answer on sockets.

Robbins & Myers Co., Springfield, Ohio.
Bulletin No. 125. Type C direct current motors.

General Electric Co., Schenectady, N. Y.
Bulletin No. 46251. Outdoor metering outfits, 4 pages.

Crouse-Hinds Co., Syracuse, N. Y.
Bulletin No. 1A. Types O and P panels, 16 pages.

Heinemann Electric Co., Philadelphia, Pa.
Catalogue and Price List. Switches, cutouts, rosettes.

Cushman Motor Works, Lincoln, Neb.
Booklet. Farm engine, 40 pages.
Leaflets. Lighting outfits.

Allen-Bradley Co., Milwaukee, Wis.
Bulletin B-7. Current limit type d.c. automatic motor starters, 12 pages.

Harrison Safety Boiler Works, Philadelphia, Pa.
Leaflet No. 17. Reducing boiler room costs, 20 pages.

Condensite Co. of America, Bloomfield, N. J.
Booklet. Condensite for electrical insulation.

Bridgeport Brass Co., Bridgeport, Conn.
Mailing Card. Phono-electric trolley wire.

Radium Light Co., Pittsburgh, Pa.
Folder. Flashlights and lanterns.

E. H. Freeman Electric Co., Trenton, N. J.
Catalogue No. 5. Wiring devices, 48 pages.

Globe Stove & Range Co., Kokomo, Ind.
Booklet. Art of electric cooking, 16 pages.
Folder. Electric ranges.

Jordan Bros., Inc., New York.
Booklet. Commutator truing device, 32 pages.

Hartman Electrical Mfg. Co., Mansfield, Ohio.
Bulletin No. 12. Electrical specialties for automobiles, 8 pages.

Best Electric Co., Pittsburgh, Pa.
Folders. Key and lock sockets and plugs.

A. C. Manweiler Co., Ft. Wayne, Ind.
Price List. Miniature incandescent lamps.

Sprague Electric Works, New York.
Folder. Greenfieldduct.

Steel City Electric Co., Pittsburgh, Pa.
Folders. Marchand clamps.

J. H. Bunnell & Co., Inc., New York.
Folder. Jove fire alarm box.

Pittsburgh Valve & Fittings Co., Barberton, Ohio.
Booklet. Electric brackets, 32 pages.

Price Air Brush Co., Indianapolis, Ind.
Booklet. Air brushes.

Standard Electric Stove Co., Toledo, Ohio.
Booklet. Electric stoves, ranges and fireless cookers, 32 pages.

Temco Electric Motor Co., Leipsic, Ohio.
Booklet. Portable electric tools, 20 pages.

Delta-Star Electric Co., Chicago, Ill.
Bulletin No. 15. Unit type high tension indoor equipment, 80 pages.

Atwater Electric Works, Coopersville, N. Y.
Bulletin No. 7. Buffing lathes and grinders, 4 pages.

Connecticut Electric Mfg. Co., Bridgeport, Conn.
Catalogue No. 5. Wiring devices and electric specialties, 68 pages.

Musolaphone Corporation, New York.
Catalogue. Paging systems, 40 pages.

Archbold-Brady Co., Syracuse, N. Y.
Booklet. Steel transmission structures and catenary bridges. 32 pages.

Rauch & Lang, Cleveland, Ohio.
Booklet. Electric vehicles, 16 pages.

Emerson Electric Mfg. Co., St. Louis, Mo.
Catalogue No. 6700. 1915 fan motors for alternating and direct current, 48 pages.

Hart & Hegeman Mfg. Co., Hartford, Conn.
Wall cards. Pipe taplets.

JOVIAN LEAGUES

For the information of Jovians who visit any of the following cities we give below the time and place at which each of the several Luncheon Clubs meet:

Akron—Monday, 11:30 a. m., Black Whale Inn.

Baltimore—Thursday, 12:30 p. m., Emerson Hotel.

Benton Harbor—Second Tuesday of month, place determined by members.

Bluefield—Last Saturday of month, 7:30 p. m., Altamont Hotel.

Boise—Every other Thursday, 12 m., Commercial Club or Owyhee hotel.

Buffalo—Saturday, 12:30 p. m., Lafayette Hotel.

Calgary—Twice a month, 12:15 p. m., Cronn's Rathskeller.

Charlotte—First and third Saturday of month, 1 p. m., Gem Cafe.

Chattanooga—Thursday, 12:30 p. m., Read House.

Chicago—Monday, 12:15 p. m., Hotel Sherman.

Cincinnati—Every other Monday, 12:30 p. m., Gibson Hotel.

Cleveland—Thursday, 12 m., club rooms, Hollenden Hotel.

Columbus—Every other Thursday, 6 p. m., and 12 m., alternately different hotels.

Dallas—Monday, 12 m., Oriental Hotel.

Dayton—First and third Monday of month, 12 m., Dayton Club.

Des Moines—Sat. 12:30 p. m., Kirkwood and Randolph, alternately.

Detroit—First and Third Saturday of month, 1 p. m., Board of Commerce.

Duluth—Second and fourth Wednesday, 12:15 p. m., St. Louis Hotel.

Erie—First and third Monday of each month, 6:30 p. m., Reed House.

Fort Wayne—15th of each month, hour selected, Wayne Hotel.

Fort Worth—Tuesday, 12:15 p. m., at different cafes.

Galveston—Third Monday of month, Galveston Commercial Association.

Grand Rapids—First Sat. of month, 12:15 p. m., Association of Commerce.

Hartford—Thursday, 12:30 p. m., Bond's Cafe.

Houston—Tuesday, 12:15 p. m., Bender Hotel.

Huntington—Last Friday, each month, Frederick Hotel.

Indianapolis—Monday, 12:15 p. m., Hotel Severin.

Knoxville—First Tuesday of month, 12 m., Imperial Hotel.

La Crosse—Second and last Monday of month, 12 m., La Crosse Club.

Lethbridge—First Monday of month, 8 p. m., offices of Municipal Railway.

Lexington—First Tuesday after tenth of month, place to be selected.

Los Angeles—Wednesday, 12 m., Christopher's, No. 551 S. Broadway.

Louisville—Tuesday 12:15 p. m., Preston Hotel.

Milwaukee—Every other Tuesday, 12:15 p. m., Hotel Blatz.

Minneapolis—Every other Tuesday, 12 m., breakfast room, Rogers Hotel.

Nashville—First and third Saturday of month, 12:30 p. m., Hermitage Hotel.

New Castle—Every Wednesday, 12 m., Y. M. C. A.

New Orleans—Second and Fourth Tuesday, 12:05 p. m., Hotel De Soto.

New York—First and third Wednesday of month, 12:30 p. m., Hotel Martinique.

Norfolk—Fourth Friday of month, 8 p. m., Lorraine and Lynnhaven.

Oklahoma City—Friday, 12 m., Skirvin Hotel.

Peoria—First and third Saturday of month, 1 p. m., Jefferson Hotel.

Philadelphia—Thursday, 12:30 p. m., Hotel Adelphia.

Pittsburgh—Thursday, 12:15 p. m., Fort Pitt Hotel.

Pittsfield—First Saturday of each month, 6:30 p. m., Wendell Hotel. Informal lunch every Wednesday, 12:15 p. m., G. E. Co.'s restaurant, Kellogg st.

Portland—Thursday, 12:15 p. m., Hazelwood Restaurant.

Richmond—Fourth Tuesday each month, 1 p. m., Business Men's Club.

Rochester—Thursday, 12:15 p. m., Chamber of Commerce.

Sacramento—Saturday, 12:15 p. m., Peerless Cafe.

St. Louis—Tuesday, 12:30 p. m., American Annex, Market street.

St. Paul—First and third Thursday, 12:10 p. m., Emporium Tea Room.

Salt Lake—Thursday, 12:30 p. m., Commercial Club.

San Antonio—Wednesday, 12 m., at St. Anthony Hotel, and on second Thursday of each month at 6:45 p. m., at different cafes.

San Francisco—Wednesday 12:15 p. m., 621 Bush street.

Schenectady—Third Wednesday of month, 12:15 p. m., Glenn's Restaurant.

Seattle—Friday, 12:30 p. m., Hotel Lincoln.

Sioux City—Thursday, 12 m., different hotels.

Spokane—Fourth Tuesday of month, 12 m., East Room, Davenport's.

Springfield, Ohio—Last Friday of month, 12 m., Commercial Club.

Syracuse—Saturday, 12:15 p. m., Empire Hotel.

Tacoma, Wash.—Tuesday, 12 m., Grill Room, Hotel Olympus.

Toledo—Saturday 12 m., Kaiserhof, States Inn, and Stifler & Kest's Cafe.

Toronto—Friday, 1 p. m., Prince George Hotel.

Twin Falls—Third Thursday, 7 p. m., Room 5, Power Building.

Waco—Thursdays, 12 m., Riggins Hotel.

Warren—Second and fourth Friday, 6:30 p. m., at different places.

Washington, D. C.—Wednesday, 12:30 p. m., Commercial Club.

Wichita—Second and last Saturday of month, 12 m., Wichita and Kansas Clubs, alternately.

Winnipeg—Every other Wednesday of month, 12:15 p. m., St. Regis Hotel.

National Electrical Week

A large number of men representing all departments of the electrical industry met at the offices of the Society for Electrical Development, Inc., 29 West 39th street, New York, on March 4. The conference lasted for several hours, most of the discussion centering in the question as to the proper time for such a week. Most of those present thought it best to develop plans slowly and postpone the event until the spring of 1916. Others thought the autumn of 1915 the best time. It was finally decided to leave the selection of the date to a steering committee. The steering committee will consist of about 25 members selected from the industry at large. A nominating committee consisting of Messrs. George Williams, R. D. Lillibridge, E. W. Rockafellow, J. R. Strong, and H. M. Wilson was appointed to make this selection. The names of the steering committee will be announced later.

NEWLY APPROVED FITTINGS

Cabinets

Cabinets shown by tests and exanimations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters. Made by Detroit Fuse & Mfg. Co., Windsor, Ontario.

Cabinets shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters. Made by Detroit Fuse & Mfg. Co., 1400-1414 Rivard street, Detroit, Mich.

Cabinets shown by tests and exanimations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters. Made by Large-Dail Mfg. Co., 114 N. 13th street, Philadelphia, Pa.

Fixture Parts

"Harter" adjustable support for "Harter" lamp receptacle, consisting of a galvanized steel yoke and two clamping bands enclosed in a brass shell. (Re-examined.) Made by Harter Mfg. Co., 1132 W. Austin avenue, Chicago, Ill.

Fuses, Cartridge Enclosed

Non-refillable cartridge enclosed fuses. Ferrule type, 0-60 ampere, 250 volts. (Re-examined.) Made by Multi-Refillable Fuse Co., 729 Fulton street, Chicago, Ill.

Picture Machines and Appliances

"Kinak" motion picture machine, a portable, automatic, motor-driven, moving picture machine, complete with metal housing and paper screen, for advertising purposes, operating on principle of reflection and using an opaque positive paper film. The electrical parts of device comprise 8-v. incandescent lamps in series on a special circular fixture with a current limiting resistance, a 1-50 h.p. motor with an automatic reversing switch, and necessary wiring connections. Rating 5 a., 110 v. (Re-examined.) Made by Kinak Motion Picture Co., Inc., 1777 Broadway, New York.

"Safety-Scope" portable, hand-operated, motion picture machine, made in two types; one having a tripod base and the other having mechanism mounted in a transite asbestos board case. The electrical parts of this device comprise a 100-w. gas filled incandescent lamp of special form, and a portable cord for attachment to supply circuit. (Re-examined.) Made by Motion Picture-Scope Co., Peoples Gas Bldg., Chicago, Ill.

Panelboards

Panelboards shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters. Made by Large-Dail Mfg. Co., 114 N. 13th street, Philadelphia, Pa.

Receptacles, Standard

"Harter," keyless, 660 w., 250 v. (Re-examined.) Made by Harter Mfg. Co., 1132 W. Austin avenue, Chicago, Ill.

Standard for use only in approved 1-light fixtures especially constructed to provide a complete enclosure of receptacle, and adequate separation between current-carrying metal parts of receptacle and metal of fixture. 1500 w., 250 v. (Re-examined.) Made by General Electric Co., Schenectady, N. Y.

Rosettes, Fuseless

"J. C. P." porcelain rosette with supports for attaching to outlet boxes with plain ring covers plastered into wall or ceiling. (Re-examined.) Made by J. C. Phelps, 392 Main street, Springfield, Mass.

Sockets, Standard

Porcelain key socket. For use only in places where they will not be exposed to hard usage. Made by Peru Electric Co., Peru, Ind.

Signs, Electric

Electric signs shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters. Made by Eugene I. Rosenfeld & Co., Inc., 8-10 S. Howard street, Baltimore, Md.

Signal Appliances

"Amico" signal system for control of bells and horns. A code signal device controlling a low voltage battery current used to operate magnet of a relay switch which controls bell or horn circuit of not over 6 a., at 125 v. Bells and horns to be wired in multiple. (Re-examined.) Made by American Model & Instrument Co., 25 Forster street, Worcester, Mass.

Switch Boxes

C. P. & S. Co pressed steel boxes for mounting flush switches and receptacles and having one removable side to facilitate assembly for use in gangs. Made by Cleveland Pressed Steel Co., 526-530 Chapman avenue, Cleveland, O.

Lamp Adjuster

"L. B. & G." adjuster for open wiring and pendant lamps, consisting of a standard key socket, a length of portable cord, a spring-controlled composition drum, to which ends of portable cord are attached and connected in circuit through insulated brushes and contact rings. A cylindrical brass shell encloses operating parts and is provided with an insulating bushing at lower end through which cord passes. (Re-examined.) Made by Lamb Bros. & Greene, Nappanee, Ind.

New York Electrical Exposition, October 6-16, 1915

For the ninth consecutive year the New York Electrical Exposition will be repeated next autumn at the Grand Central Palace. It will be held from October 6 to 16. That time is considered the best of the year, as it marks the beginning of the autumn and winter activities, at the conclusion of the heated term. Owing to the San Francisco Fair and the great number of Americans staying at home this year, the indications are that New York will be crowded as never before, and it is planned to take the fullest advantage of these conditions to promote local electrical activities. Should the war have ended by October there will be enormous purchasing occasions for European markets. If not ended by that time, our increase in foreign trade, without precedent in the history of the country, should result in wide extensions of existing enterprises and many new undertaking and great activity in every department of industrial life. The policy of making this the great advertising display and educational occasion of the year will be continued, with even greater effort than in the past.

Price Reductions in Edison Mazda Lamps

Practically all the sizes and types of Edison mazda multiple lamps are affected by reductions in list prices that were put into effect April 1, 1915, by the Edison Lamp Works of General Electric Co. On the regular straight side and round bulb lamps, from the 10-watt to the 250-watt sizes, also on sign lamps and stereopticon lamps, the reductions range from 3 to 20 cents per lamp, according to the size. These reductions average about 10 per cent.

The new concentrated filament vacuum lamps of 25, 40, and 60-watt sizes now list at only 5 cents per lamp more than the regular lamps of corresponding sizes.

On the gas-filled, multiple lamp of 100 to 1,000-watt sizes, the reductions range from 50 cents to $1 per lamp, the average reductions being between 20 and 25 per cent. The introduction of gas-filled lamps has been exceptionally rapid. Over a million are already in use. The decreased cost of these lamps will undoubtedly result in a still more rapid replacement of vacuum lamps by the more efficient gas-filled units.

RECENT ELECTRICAL PATENTS

Batteries

1,129,690. *Electric Storage Battery.* Karola Knobloch, Baltimore, Md., assignor, by mesne assignments, to The Storage Battery Appliance Co., Baltimore, Md.

1,127,839. *Portable Battery-Light.* Leroy A. Williamson, New York, N. Y.

1,128,275. *Storage Battery.* Almond H. Snyder, Lancaster, N. Y., assignor to Gould Storage Battery Co.

1,127,936. *Storage-Battery Cell.* Almond H. Snyder, Lancaster, N. Y., assignor to Gould Storage Battery Co.

1,128,232. *Storage-Battery-Separator Construction.* Jasper N. Davis, Denver, Colo.

1,130,162. *Battery-Connector.* Noah Hale, Corpus Christi, Texas.

1,130,640. *Battery-Separator and Process of Making the Same.* James M. Skinner, Philadelphia, Pa., assignor to Philadelphia Storage Battery Co., Philadelphia, Pa.

Controlling and Regulating Devices

1,127,464. *Electric Regenerative Motor and System of Control.* Robert Lundell, New York, N. Y.

1,130,320. *Circuit-Controller.* William Morrison, Des Moines, Iowa.

1,130,476. *Rheostat-Controller.* George P. Carroll, Bridgeport, Conn.

1,128,778. *Thermostatic Regulating Device.* Isiah Hall, Birmingham, England.

Electric Switches and Cutouts

1,129,287. *Electromagnetic Switch.* Stephen E. Gamble, Petaluma, Cal.

1,127,408. *Electric Switch.* Robert C. Cole, Hartford, Conn., assignor to The Johns-Pratt Co., Hartford, Conn.

1,129,996. *Time-Controlled Switch Mechanism for Electric Circuits.* Horace B. McCabe, Chicago, Ill., assignor to Gisholt Machine Co., Madison, Wis.

1,129,097. *Electric Railway-Switch.* George Hyler and Beauford Herbison, Lansing, Mich.

1,127,442. *Electrical Switch.* Bryson D. Horton, Detroit, Mich.

1,129,812. *Electric Switch.* Delbert E. Robinson, Enid, Okla.

1,127,996. *Electric Switch.* Philip Vassar Hunter, Newcastle-upon-Tyne, England.

1,130,204. *Electric Switch.* Hjalmar R. Schultz and Frederick Brereton Holt, Manchester, England, assignors to Westinghouse Electric & Mfg. Co.

1,127,779. *Electric Switch.* Charles J. Klein, Milwaukee, Wis.

1,130,340. *Trolley-Switch.* John J. Ruddick, Newton, Mass., assignor to United States Electric Signal Co., West Newton, Mass.

1,128,505. *Operating Mechanism for Switches.* Augustine J. Pocock, Dayton, Ohio.

1,129,568. *Electrical Switch.* Bryson D. Horton, Detroit, Mich., assignor to Detroit Fuse & Mfg. Co., Detroit, Mich.

1,129,569. *Electrical Switch.* Bryson D. Horton, Detroit, Mich.

Generators, Motors, and Converters

1,129,470. *Alternating-Current Transformer.* Charles Le Geyt Fortescue, Pittsburgh, Pa., assignor to Westinghouse Electric & Mfg. Co.

1,130,269. *Electrical Transformer.* Emil Haefely, Basel, Switzerland, assignor to Westinghouse Electric & Mfg. Co.

1,129,463. *Transformer.* Charles Le G. Fortescue, Pittsburgh, Pa., assignor to Westinghouse Electric & Mfg. Co.

1,130,257. *Generator for Intermittent Electric Currents.* Jonas Carter, Waukegan, Ill.

1,129,036. *Electric Motor.* Ernest Gustav Hoffmann, New Rochelle, N. Y.

1,129,231. *Transformer.* Lewis T. Robinson and James R. Craighead, Schenectady, N. Y., assignors to General Electric Co.

1,129,473. *Transformer for Electric Currents.* Charles Le G. Fortescue, Pittsburgh, Pa., assignor to Westinghouse Electric & Mfg. Co.

1,127,414. *Dynamo-Electric Machine.* William W. Dean, Elyria, Ohio, assignor, by mesne assignments, to the Garford Mfg. Co., Elyria, Ohio.

1,128,914. *Magneto-Electric Generator.* Chester A. Stone and Garnet C. Brown, Buffalo, N. Y.

1,130,211. *Dynamo-Electric Machine.* Charles W. Starker, Pittsburgh, Pa., assignor to Westinghouse Electric & Mfg. Co.

1,129,216. *Ignition-Generator for Electric Starter Systems.* Alden L. McMurthy, Sound Beach, Conn.

1,130,260. *Transformer.* Waiter M. Dann, Wilkinsburg, Pa., assignor to Westinghouse Electric & Mfg. Co.

1,129,700. *Dynamo.* Milton S. Lysinger, Norristown, Pa.

1,129,474. *Transformer.* Charles Le G. Fortescue, Pittsburgh, Pa., assignor to Westinghouse Electric & Mfg. Co.

1,127,563. *Dynamo-Electric Machine.* Gabriel Winter, deceased, by Otto Wolfrum, administrator, Vienna, Austria-Hungary, and Friedrich Eichberg, Berlin, Germany.

1,129,465. *Transformer.* Charles Le G. Fortescue, Pittsburgh, Pa., assignor to Westinghouse Electric & Manufacturing Co., a Corporation of Pennsylvania.

1,130,017. *Centrifugal Circuit-Changing Device for Electric Motors.* Edwin S. Pillsbury, St. Louis, Mo., assignor to Century Electric Co.

WANTS—FOR SALE—AGENTS

DO YOU WANT A LIVE NEW YORK REPRESENTATIVE? We have been established many years, well known to the trade, have good sales organization, and warehouse facilities. Sold $70,000 worth of one manufacturer's products last year. We are increasing our sales organization, and will be able to handle an additional line or two. Only first class connection and high grade electrical apparatus, or specialties, will be considered. Address, Electric Room, 907, 171 Madison Ave., New York.

FIRM IN THE NETHERLANDS (neutral country), well acquainted with electrical supplies and allied trades, is willing to act as buying agency for American concern. Address S. A. J., Suite 610, Evening Post Bldg., New York.

FOR SALE—Manufacturers of Lighting Fixtures, now doing a business of $40,000 per year, offer to sell business complete with machinery, stock, catalogue, etc., at less than 50% inventory. Show room contains 325 finished samples. Plant new, two story, 30 x 100, electric power, situated 50 feet from freight depot on siding N. Y., N. H. & H. R. R. Rent, $350 per year. Labor reasonable and non-union. Raw material twelve miles, trolley freight to door. Catalogue new. Electrotypes of about 400 fixtures. This with good will gratis. Correspondence and inspection invited. Address Box 59, Plantsville, Conn.

LARGE TOY MANUFACTURER with established trade desires connections with electrician having working models of electric novelties and toys. Exceptional opportunity for right man. Box 4-A, c/o ELECTRICAL RECORD.

TO ELECTRIC SPECIALTY MANUFACTURERS desiring a Pacific Coast agent to the jobbers and Department Stores on a commission basis, I can furnish sufficient evidence that I have the facilities and finance to induce buyers to stock a reputable product and I have the space to carry stock of same. Your enquiry will substantiate this. T. C. Massey, Seattle, Wash.

WINDER—First-class Armature and Stator winder and general repairman, experienced and thoroughly familiar with all A. C. and D. C. winding, also the installation, care and repair of motors and generators, desires position with good firm. A. C. work preferred; will go anywhere. Address Box 36, ELECTRICAL RECORD.

SPLENDID PAYING PERMANENT POSITION for man of proven ability and reputation as District Manager for manufacturers' exclusive electrical specialties. Must be familiar with big proposition. Small capital required to carry stock. A good organizer should certainly net $5,000 first year. The Sterling Corporation, 1275 West Third St., Cleveland, Ohio.

CLASSIFIED INDEX

ACETYLENE LIGHTERS.
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ADAPTERS, Auto Lamp.

For changing Gas or Oil Lamps to Electric.

GENERAL ELECTRIC CO., Schenectady, N. Y.
HUBBELL, INC., HARVEY, Bridgeport, Conn., "Dazlite."
MANHATTAN ELEC'L SUPPLY CO., 17 Park place, New York.
METAL SPECIALTIES MFG. CO., 738 W. Monroe st., Chicago, Ill. "Gil-Bo."
MORSE, FRANK W., Boston, Mass., "Electrofier."
PLUME & ATWOOD MFG. CO., Waterbury, Conn.
ROSEN & CO., A. W., 610 Broadway, New York, N. Y.
STANDARD ELEC. NOVELTY CO., 10 N. Desplaines st., Chicago, Ill.

Black Mfg. Co., Fort Wayne, Ind.
Campbell Co., A. S., Boston, "Cello."
Castle Lamp Co., Amesbury, Mass.
Chicago Electric Mfg. Co., Chicago.
Cole & Co., Henry, Boston, Mass.
Gray & Davis, Cambridge, Mass.
Horn & Brannen Mfg. Co., Phila.

ADAPTERS, Lamp.

Tungsten Adapters.
Socket Adapters & Extensions.

BENJAMIN ELECTRIC MFG. CO., 120 So. Sangamon st., Chicago, Ill. (Tungsten Adapters).
BRYANT ELEC. CO., Bridgeport, Conn. (Candelabra).
FEDERAL SIGN SYSTEM (ELEC.), Lake & Desplaines sts., Chicago, Ill.
HUBBELL, INC., HARVEY, Bridgeport, Conn.
WHITE MFG. CO., J. H., Brooklyn, N. Y. (Tungsten).

Advance Mfg. Co., Pittsburgh, Pa.
Arrow Electric Co., Hartford, Conn.
Erikson Elec. Co., L., Boston, Mass. (Tungsten Adjustable Joint).
Phila. Elec'l & Mfg. Co., Phila., Pa.
Westinghouse Lamp Co., New York.

ADJUSTABLE FIXT. BRACKETS.
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ADJUSTERS, Cord & Lamp.

AMERICAN VULCANIZED FIBRE CO., 500 Equitable Bldg., Wilmington, Del., "Q. & C."
AUSTIN & CO., M. B., 700 Jackson blvd., Chicago, Ill., "Gem."
CONDIT ELECTRICAL MFG. CO., Boston, Mass., "Saca."
DIAMOND STATE FIBRE CO., Bridgeport, Pa.
McGILL MFG. CO., 39 Oak st., Valparaiso, Ind., "Innovate."
MATTHEWS & BRO., W. N., 3705 Forest Park blvd., St. Louis, Mo., "Easy."
MORSE, FRANK W., Boston, Mass. ("Handy" Cord and "Webster" Lamp Adjuster).
PHELPS MFG. CO., Detroit, Mich. ("Any Angle" Lamp Fixture).
TRUMBULL ELECTRIC MFG. CO., Plainville, Conn.
YOST ELEC. MFG. CO., Toledo, O. ("Electrogrip" Lamp Adjuster).

Advance Mfg. Co., Pittsburgh, Pa., "Heinz."
American Enamel Co., Providence.
Arrow Electric Co., Hartford, Conn., "Dow."
Bates, H. A., Garwood, N. J., "Slip-on."
Carter & Co., J. W., Abilene, Texas, "Eclipse."
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Estes & Sons, E. E., New York (Wood).
Gam Mfg. Co., Lancaster, Pa.
Gund Mfg. Co., La Crosse, Wis., "Two Ball."
Hagstrom Bros. Mfg. Co., Lindsborg, Kan. (Push Button).
Harter Specialty Co., Waukegan, Ill.
Johnny Co., Greenville, O.
Lorentz, Henry E., Baltimore, Md.
Milam & Son, B. C., Frankfort, Ky.
Novelty Turning Co., Norway, Me.
Reel Adjustable Fixture Co., Chicago.
Runzel-Lenz Electric Mfg. Co., Chicago, Ill. ("R-L" Telephone Switchboard Cord Length Adjuster).
Stewart Elec. Co., F. H., Phila., Pa.

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Electric Devices & Mfg. Co., Chicago, Ill.

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OSTRANDER & CO., W. R., 22 Dey st., New York, N. Y., "Neu."
STANLEY & PATTERSON, 23 Murray st., New York, N. Y., "Patterson."
WALDMAN, JOHN J., 136 Liberty st., New York, N. Y.

Irish Electric Co., W. F., New York, "Shamrock."
Partrick & Wilkins Co., Philadelphia, Pa.

ALUMINUM.

ALUMINUM CO. OF AMERICA, Pittsburgh, Pa.

Elec. Smelting & Aluminum Co., Lockport, N. Y.
So. Aluminum Co., Whitney, N. C.

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ANCHORS, Guy, also Rods.

CROUSE-HINDS CO., Syracuse, N. Y., "Harpoon," "Adjustarod."
ELECTRIC OPERATIONS CO., Bush Terminal, Brooklyn, N. Y.
LANZ & SONS, M., Pittsburgh, Pa.
MATTHEWS & BRO., W. N., 3705 Forest Park blvd., St. Louis, Mo.
OSHKOSH MFG. CO., Oshkosh, Wis.
ST. LOUIS MALLEABLE CASTING CO., 7777 N. Conduit ave., St. Louis, Mo., "O. K."

Barbed Anchor Mfg. Co., Louisville.
Barnes & Kobert Mfg. Co., Milldale, Conn., "B. & K."
Benicia Iron Works, San Francisco.
Bluffton Anchor Co., Bluffton, O.
Chance Mfg. Co., Centralia, Mo., "Never Creep."
Everstick Anchor Co., St. Louis.
Falls Elec. Co., Lima, O., "Clum."
Gund Mfg. Co., La Crosse, Wis., "D. & T."
Hallett Iron Wks., Harvey, Ill., "Hiawatha."
Johns-Manville Co., H. W., New York, N. Y., "J-M."
Klein & Sons, Mathias, Chicago, Ill.
Line Material Co., So. Milwaukee, Wis. (Guy Rods).
Miller Anchor Co., Norwalk, O., "Safety."
New England Bolt & Supply Co., Everett, Mass. (Guy Ropes).
Oliver Iron & Steel Co., Pittsburgh, Pa. (Guy Rods).
Simpson Anchor Co., Niagara Falls.
Specialty Device Co., Cincinnati, O., "Bierce."
Universal Cable Grip Co., Syracuse, N. Y., "Red Top."
Wapak Hollow Ware Co., Wapakoneta, O.

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ANNUNCIATORS, Limousine.

Cowels & Co., C., New Haven, Conn.
O'Brien Co., Joseph F., New York.

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Elevator, Telephone, Hotel, Burglar Alarm.

ANSONIA ELECTRICAL CO., Ansonia, Conn.
CONNECTICUT TELEPHONE & ELECTRIC CO., Meriden, Conn.
DE VEAU TELEPHONE MFG. CO., 477 18th st., Brooklyn, N. Y., "Auth."
EDWARDS & CO., New York, "Dixie," "Etonial," "Semaphore."
HOLTZER-CABOT ELECTRIC CO., Boston, Mass.
MANHATTAN ELECTRICAL SUPPLY CO., 17 Park pl., New York.
MENOMINEE ELEC. MFG. CO., Menominee, Mich.
OSTRANDER & CO., W. R., 22 Dey st., New York.
PARTRICK & WILKINS CO., Philadelphia, Pa., "Competition."
STANLEY & PATTERSON, 23 Murray st., New York, N. Y., "Premier."

Couch Co., S. H., Norfolk Downs, Mass., "Coelco."
Hepburn Tele. Mfg. Co., Chicago (Illuminated).
Moon Mfg. Co., Chicago, Ill., "Knapp," "Eclipse," "Acme."
Samson Elec. Co., Canton, Mass., "Ross," "Rival," "Dandy," "Hub."

ANTI-HUMS.

BUNNELL & CO., J. H., 32 Park pl., New York.
MANHATTAN ELEC'L SUPPLY CO., 17 Park pl., New York.

ANTISEPTIC MOUTHPIECES.
See Mouthpieces, Telephone.

ARC LAMP APPLIANCES.
See Specific Articles.

ARMATURE MACHINES.
See Machines, Armature.

ARMATURES.

See Adv. Pages 192-193

ARMORED CABLE.
See Conduit, Interior.

ARMS, CROSS, Concrete.

Ohio Cross Arms Co., Columbus, O.

ARMS, CROSS, IRON.
See Brackets, Arms, Pins.

ARMS, CROSS, (Wood).

BARNES - LINDSLEY MFG. CO., Portland, Ore.
BERTHOLD & JENNINGS LUMBER CO., Wright Bldg., St. Louis, Mo.
BISSELL CO., F., 226 Huron st., Toledo, O.
CENTRAL LUMBER CO., Chattanooga, Tenn.
FOWLER & CO., J. H., Fisher Bldg., Chicago, Ill.
LINDSAY BROS. CO., Spokane, Wash.
SOUTHERN EXCHANGE CO., 97 Warren st., New York, N. Y.
WESTERN LUMBER & POLE CO., Spokane, Wash.

Absher Co., W. M., North Wilkesboro, N. C.
Am. Creosote Wks., New Orleans, La.
Am. Cross Arm Co., Chicago, Ill.
Atlantic Creosoting & Wood Preserving Co., Norfolk, W. Va.
Berlin Mills Co., Portland, Me. (Kyanized).
Boggs & McNeill Co., Albany, Ga.
Cohn & Bock, Princess Anne, Md.
Cranston Lumber Co., John A., Wilmington, Del.
Doty (Wash.) Lumber & Shingle Co.
Elkin Machinery Co., Elkin, N. C.
Ferguson Lbr. Co., Little Rock, Ark.
Georgia Tie & Lumber Co., N. Y.
Gulfport (Miss.) Creosoting Co.
Hamilton & Strong, Colville, Wash.
International Creosoting & Cons. Co., Galveston, Tex.
Lacey Lumber Co., Carrier, Miss.
Lord & Co., L. H., Peoria, Ill.
Louisiana Red Cypress Co., New Orleans, La.
Megahan & Co., Westerville, O.
Morse Lumber Co., Los Angeles.
Noblett Co., E. J., Chattanooga.
Norfolk Creosoting Co., Norfolk, Va.
Roper Lumber Co., Norfolk, Va.
Seattle (Wash.) Timber Supply Co.
South. Pine Mfg. Co., Paducah, Ky.
Swayne R. B., San Francisco, Cal.
Tacoma-Seattle Timber Co., Tacoma.
Texas Arm & Pin Co., Beaumont.
Vuncannon, J. B., West End, N. C.
Wade & Co., Shippensburg, Pa.
Williams Cypress Co., F. B., Patterson, La.
Wykoff Pipe & Creosoting Co., N. Y.
Zeones Lumber Co., Pe Ell, Wash.

ARMS, Mast.

BRADY ELECTRIC MFG. CO., New Britain, Conn.
CUTTER CO., GEO., 411 Notre Dame, South Bend, Ind.
ELECTRIC RAILWAY EQUIPMENT CO., Cincinnati, O.
MORRIS, ELMER P., 136 Liberty st., New York.

Buffalo Specialty Co., Buffalo, N. Y.
Fletcher Mfg. Co., Dayton, O.
Line Material Co., So. Milwaukee, Wis.
Lundin Elec. & Mach. Co., Boston, Mass., "Philbrick."
Phila. (Pa.) Elec'l Mfg. Co.
Russell Elec. Mfg. Co., Providence.

ARRESTERS, Lightning.

Light and Power.

GENERAL ELECTRIC CO., Schenectady, N. Y.
WESTINGHOUSE ELEC. & MFG. CO., East Pittsburgh, Pa., "Wurtz."
WOOLLEY, W. DOUGLAS, 30 N. Michigan ave., Chicago, Ill., "C-C Non-Gap."

Arrow Conductor & Mfg. Co., Chicago.
Brach Supply Co., L. S., New York.
Delta-Star Elec. Co., Chicago, Ill.
Elec. Service Supplies Co., Phila.
Gifford El. Mfg. Co., Traverse City, Mich.
Lord Mfg. Co., Brooklyn, N. Y., "Shaw," "Multi-Vapo-Gap," "Abacot."
Oleson Spring Co., Toledo, O.
Railway & Industrial Engineering Co., Greensburg, Pa.

ARRESTERS, Lightning.

Telephone and Telegraph.

BUNNELL & CO., J. H., 32 Park pl., New York, N. Y., "Union," "Triangle."
CHICAGO FUSE MFG. CO., Chicago.
D. & W. FUSE CO., Providence, R. I.
MANHATTAN ELEC'L SUPPLY CO., 17 Park pl., New York, "Union."
RELIABLE ELEC. CO., Chicago, Ill.

Am. Elec. Co., Chicago, Ill.
Automatic Fusible Lightning Arrester Co., Colorado Springs, Colo.
Brach Supply Co., L. S., New York.
Butler Elec. Co., Easton, Pa.
Chance Mfg. Co., Centralia, Mo., "Sky-Rocket."
Cook, F. B., Chicago, Ill.
Cox Arrester Co., C. E., Eaton, Ohio.
Cracraft, Leich Elec. Co., Genoa, Ill. (Self-Cleaning Shunt Arresters).
Ericsson Mfg. Co., Buffalo, N. Y.
Foote, Pierson & Co., New York, "Argus."
Garford Mfg. Co., Elyria, O.
Gifford Elec. Mfg. Co., Traverse City, Mich., "Paradox."
Harvard Elec. Co., Chicago, Ill.
Howard, A. G., Holdredge, Neb.
Insulator Arrester Co., Duluth, Minn.
Kellogg Switchboard & Supply Co., Chicago, Ill.
Minneapolis (Minn.) El. Co., "Chapman."
National Elec. Specialty Co., Toledo, O., "Vac-M."
P. & M. Co., Chicago, Ill.
Railway & Industrial Engineering Co., Greensburg, Pa.
Royal Elec. Co., Sidney, O., "Hypostat."
Schinn, W. C., Lincoln, Neb.
Stromberg-Carlson Tele. Mfg. Co., Rochester, N. Y.

ARTIFICIAL (PHANTOM) LOAD INSTRUMENTS. — See Instruments, Testing and Measuring.

ASBESTOS.

Sheet, Paper, Mill Board, Lumber.
Acme Asbestos Covering & Supply Co., Chicago.
Carey Mfg. Co., Phillip, Cincinnati.
Ehret Magnesia Mfg. Co., Phila.
Franklin Mfg. Co., Franklin, Pa.
General Asbestos & Rubber Co., Charleston, S. C.
Johns-Manville Co., H. W., N. Y.
Keasbey & Mattison Co., Ambler, Pa.
New Jersey Asbestos Co., Camden, N. J., "Gladiator."
N. Y. Asbestos Mfg. Co., New York.
Norristown Magnesia & Asbestos Co., Norristown, Pa.
Sall Mountain Asbestos Mfg. Co., Chicago.
Watson Co., H. F., Erie, Pa.

ASBESTOS, WIRE.
See Wire, Asbestos.

ATTACHMENTS.

Gas Fixture.

BRYANT ELEC. CO., Bridgeport, Conn.
MANHATTAN ELEC'L SUPPLY CO., 17 Park pl., New York, N. Y.
PLUME & ATWOOD MFG. CO., Waterbury, Conn.
TRUMBULL ELEC. MFG. CO., Plainville, Conn.
WALSH MFG. CO., OWEN, 525 W. 26th st., New York, N. Y.
WHITE MFG. CO., J. H., Brooklyn, N. Y.

Am. Brass & Copper Co., New York.
American Pin Co., Waterbury, Conn.
Spencer's Sons, I. S., Guilford, Conn.
Steele & Johnson Mfg. Co., Waterbury, Conn.

ATTACHMENTS, Socket.

Socket Pulls.
Chain Adjusters.
Chain Extensions.

HUBBELL, INC., HARVEY, Bridgeport, Conn., "Ham," "Harding," "Economy."
PEERLESS LIGHT CO., Peerless Bldg., Chicago, Ill. ("Flexo" Socket Pull).
PHELPS MFG. CO., Detroit, Mich.
RITTENHOUSE CO., A. E., Honeoye Falls, N. Y., "Easylite."

Barry Mfg. Co., Boston, Mass.
Empire Engineering & Supply Co., New York.
Premier Novelty Co., Chicago, Ill. ("Just Pull" Socket Pull).

AUTOGRAPHIC RECORDERS.
See Instruments, Curve Drawing

AUTOMATIC SWITCHES.
See Switches, Remote Control; also Switches, Time.

AUTOMOBILE STARTING AND LIGHTING.—See Systems, Auto

AUTOMOBILES, Electric.

American Elec. Car Co., Saginaw, Mich., "Argo," "Broc," "Boland-Grannis."
Anderson Elec. Car Co., Detroit, Mich., "Detroit Electric."
Atlantic Vehicle Co., Newark, N. J.
Atlas Car & Mfg. Co., Cleveland, O. (Trucks).
Automatic Transportation Co., Buffalo, N. Y. (Baggage Trucks).
Bailey & Co., Amesbury, Mass.
Baker Motor Vehicle Co., Cleveland.
Beaver Motor Truck Co., Portland, Ore.
Buffalo Elec. Vehicle Co., Buffalo.
Capitol Truck Co., Denver, Colo.
Century Elec. Car Co., Detroit, Mich.
Champion Wagon Co., Oswego, N. Y. (Commercial Vehicles).
Chase Motor Truck Co., Syracuse, N. Y. (Repair Wagons).
Cleveland Galion Motor Truck Co., Cleveland, O.
Columbian Elec. Vehicle Co., Detroit.
Columbus Buggy Co., Columbus, O.
Commercial Truck Co. of Am., Phila.
Couple-Gear Co., Grand Rapids, Mich. (Commercial Vehicles).
Cyco-Electric Car Co., New York.

Electrical Record

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Vol. XVII NEW YORK, MAY, 1915 No. 5

The new rates for electric service in New York, which went into effect on the first of the month, have been extended to include power and wholesale supply as well as retail service. For all classes the average cost of service per kilowatt-hour, as well as the total cost, will depend on the number of kilowatt-hours consumed in the different segments into which the company has divided its service circles. The retail circle contains six of these segments, the power circle four, the wholesale circle five. Each segment, except that showing the lowest rate per kilowatt-hour per month, contains an arbitrary number of kilowatt-hours to be sold at the rate applying to that segment. An unlimited number of kilowatt-hours may be bought in the lowest rate segment. To get the benefit of the lower rate in any segment, the consumer must have taken the full amount not only in the preceding segment or segments, but also in the segment containing the lower rate.

One effect of the prolonged strife abroad, it is rumored, is the likelihood of orders from those in charge of British finances prohibiting the spending by municipal electricity plants of money for betterments and service extensions. If this order goes into effect prospective customers will have to do without electric service until peace is restored. Manufacturers of electrical fittings and supplies are said to be much concerned over this impending order, as it forbodes a restricted market, curtailed output, and lowered profits.

The latest business-aid service started by the government is a wood-waste exchange. It enables lumbermen and manufacturers in the various wood-using industries to utilize each other's waste to mutual advantage, aiming to effect a large saving in forest material as well as in money. As pointed out in an article on the use of wood in the electrical industry, published in a recent issue of the ELECTRICAL RECORD, there are many uses for different kinds of woods in the making of electrical products. These wood consumers may find it profitable to make use of this practical service now offered free of charge by the government. Inquiries should be addressed to the Forestry Department.

Every week the Patent Office issues a big book full of sketches and descriptions of patents granted on accredited new inventions. To the laity the sketches are blurred and the descriptions merely repetitions of turgid phrases. Regardless of the nature of the invention, the descriptions all read as if cast in the same syntactical mold. About a thousand such inventions are granted every week, showing how the promise of monopoly stimulates those gifted with imagination and a knack of putting things together. Whether the mass of these patents is worth a fraction of the effort and time put into them is an open question. An electric elevator manufacturer says he wouldn't give a dollar for the real merit in all the elevator patents ever granted. Our biggest electrical manufacturing company is a trifle more optimistic; its latest annual report shows that it believes all its patents to be worth at least one whole dollar. This fact reflects a hard headed business corporation's comment on the money value of things that some men give their lives for.

A committee of engineers now appearing before the New York constitutional convention on behalf of all the national engineering societies recommends that the office of state engineer and surveyor, now an elective political job, be abolished and a department of engineering and public works be created instead. No observing person questions the need of intelligent and disinterested direction of the many and important state engineering works, any more than he questions the wisdom of putting a competent person in charge of a battleship engine room. The direction of state engineering works should come from trained engineers with executive capacity, instead of from place holding politicians with a turn for getting the boys to vote right and often. For this reason it is to be hoped that the constitution makers will adopt the engineers' recommendations, and that if appointed the engineers will stick close to engineering and not flirt with politics.

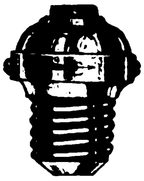
Those who profess to know say that thus far the lines of the jitney bus have indeed fallen in pleasant places. There have been no restrictions as to routes, no franchises to pay for, and no sinking funds to set aside from earnings to provide for wear and tear. The rapid development of this form of transportation is due, it is said, to a combination of no work in sight and many men with cheap cars or money enough to buy one. At practically no cost such a man could gather in enough nickels daily to provide food, clothing, and shelter through otherwise hard times. This he is doing individually. Now he threatens to do it collectively in the form of jitney companies in many parts of the country. Whether this industry is permanent or not only time will tell. Enough time has elapsed, however, since the jitney bus started in business to demonstrate that what the jitney gains the street railway loses. In some parts of the country the inroads made by this rover on the income of the street railways are really serious. Bills are now being introduced into many of the state legislatures to regulate and control this new fangled public utility.

NEW PRODUCTS

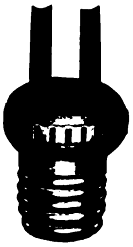
THIS DEPARTMENT IS DEVOTED EXCLUSIVELY TO NEW GOODS, AND IS A COMPLETE MONTHLY RECORD OF PROGRESS

Arrow E Attachment Plugs

Arrow E attachment plugs are made in fuse and fuseless type with brass cap. Old brass is standard finish, and polished brass will be furnished without extra charge. The cap is provided with a double bushing, the inner one having a hole 9/32 inch in diameter suitable for No. 16 approved lamp cord. The inner bushing can be removed when larger cord is to be used, leaving another bushing with 13/32 inch hole suitable for No. 16 approved portable cord.



Arrow E fuse or fuseless attachment plug. The Arrow Electric Co., Hartford, Conn.



Arrow E fuseless weatherproof attachment plug. The Arrow Electric Co., Hartford, Conn.

Arrow E molded weatherproof attachment plugs are made in fuseless type and fitted with 6-inch leads of No. 14 B & S New Code stranded rubber-covered wire. Longer wires will be provided on special order. For extra wire add 4½ cents list per foot for each conductor. This plug is especially adapted for hard usage.

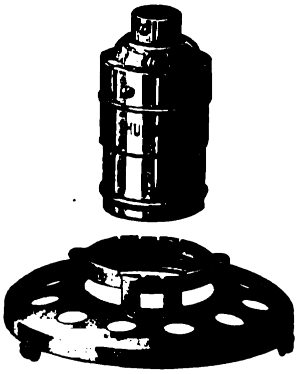
Both types are now being offered to the trade by The Arrow Electric Co., Hartford, Conn.

Hubbell Flush Receptacle, 2¼ Inch and 4 inch Shade Holders, and Attachment Plug With New Contacts

Included among the new fittings recently put on the market by Harvey Hubbell, Inc., Bridgeport, Conn., is the flush receptacle with recessed plate shown in the attached cut. It is equipped with the new Hubbell T-slot contacts, permitting the use of seventeen different types of caps. Both the receptacle and plate are recessed, thus permitting the deep insertion of the cap, so that the top of the cap is flush with the plate.

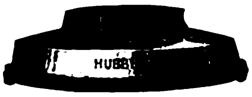
Flush receptacle with recessed plate. Harvey Hubbell, Inc., Bridgeport, Conn.

In addition to this, Harvey Hubbell, Inc., is offering the trade the new 4-inch shade holder shown in the accompanying cut. This holder is designed for use with brass shell mogul base sockets, similar to that shown in the upper part of the cut. This holder is attached to the socket by a clamp and screw arrangement which grips the socket above the bead and provides rigid center suspension for shades of any size. As shown, ventilation is provided for by 12 openings around the top. This feature makes this type of shade holder a desirable device to use in connection with the new Type C nitrogen lamps.



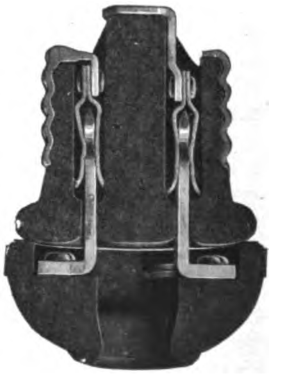
Hubbell 4-inch shade holder for use with brass shell mogul base sockets. Harvey Hubbell, Inc., Bridgeport, Conn.

The 2¼-inch Hubbell holder is fitted with the standard Hubbell contractile collar, providing rigidity and central suspension. The deep curved skirt allows ample neck room for any type of shade.



Hubbell 2¼-inch shade holder. Harvey Hubbell, Inc., Bridgeport, Conn.

Another new fitting put out by Harvey Hubbell is the No. 5815 plug. The cut shows it cut open, displaying the new style of Hubbell contacts. These contacts are deeply embedded in narrow slots, thus preventing short circuits, accidental shock, or arcs. The entire lines of interchangeable attachment plugs, wall plugs, and flush receptacles are equipped with this type of contact.



Hubbell No. 5815 plug, cut open to show new style of contacts. Harvey Hubbell, Inc., Bridgeport, Conn.

Freeman Mogul Sockets, Receptacles, Attachment Plugs, and Rosettes

The accompanying illustrations show some of the new lines of electrical fittings which have recently been marketed by the E. H. Freeman Electric Co., 803 East State street, Trenton, N. J. In addition to those depicted here, this company is also marketing sockets with shade-holder attached, porcelain receptacles, mogul base cleat receptacles, outlet box porcelain sockets, flush receptacles, screw type, outlet box and sign receptacles, and many others.

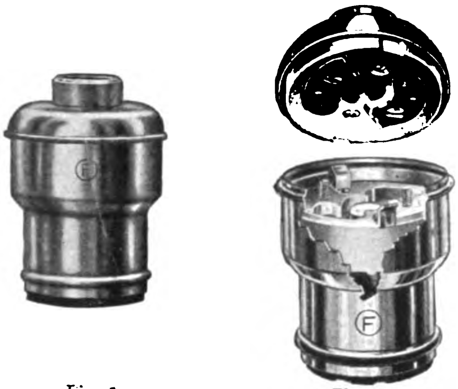


Fig. 1. Fig. 2.
Figs. 1 and 2—Freeman mogul base brass shell socket intact and exploded.

The mogul base brass shell sockets shown in Figs. 1 and 2 in addition to having brass caps are interchangeable with those used on Freeman mogul base porcelain sockets.

The mogul base porcelain sockets shown in Figs. 3 and 4 are of the standard type and can be furnished with brass or cast iron caps as required. If desired, as preferred by most fixture manufacturers, they can be furnished without caps. The socket shown in Fig. 4 can be used without cap for pendant weatherproof work, as the filling compound is covered with a heavy coating of weatherproof paint. The filling compound used in all these mogul sockets is said to harden under heat. Brass caps can be furnished in ⅜ in. and ½ in., or ¾ in. male to ½ in. female with ¾ in. brass locknut for attaching directly to shade, making a quick and inexpensive combination when complete units are not carried in stock.

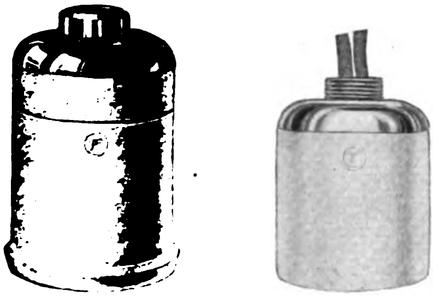


Fig. 3. Fig. 4.
Figs. 3 and 4—Freeman mogul base porcelain sockets.

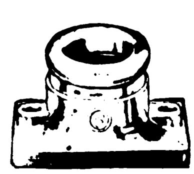


Fig. 5.
Freeman porcelain receptacle for use with wood molding and conduit fittings.

The porcelain receptacle, Fig. 5, is designed for use with wood molding or the following conduit fittings: Adapti No. 3 cover, Chicago Fuse No. 180 R cover, and Paiste ½ in. x ¾ in. taplets.

In addition to the new rosettes shown in Figs. 6, 7, and 8, which have been added to the Freeman line, the line of pony fuse and fuseless rosettes has been re-designed with the idea of easy wiring and locking. The contact springs are so formed that the most excessive vibration cannot loosen the cap and base. The special slotting in the base of the concealed type makes easy wiring, especially where local requirements demand that the loom shall not be spread at the outlet. A heavily corrugated cap adds to both the appearance and ease with which the cap and base may be separated.

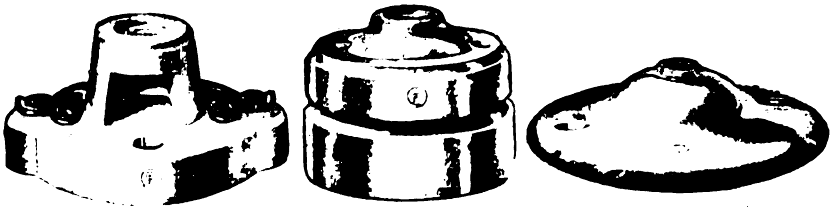


Fig. 6. Fig. 7. Fig. 8.
Figs. 6, 7, and 8—Freeman rosettes.

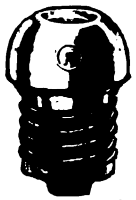


Fig. 10—Freeman non-separable attachment plug.

Fig. 9 shows the new border and footlight receptacle.

Fig. 10 shows the non-separable attachment plug. This attachment plug is of the two-piece porcelain non-separable type. The feed through holes in the upper and lower porcelains being placed slightly out of line, together with the fact that there is a small chamber between the upper and lower porcelains, allows for the clamping of the cord, thereby avoiding the necessity of tying a knot.

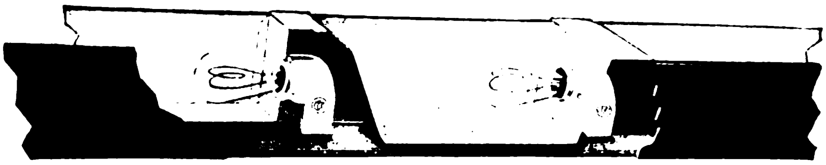


Fig. 9—Freeman border and footlight receptacle.

Tregoning Sign and Box Receptacle

The Tregoning Electric Mfg. Co., 422 West Prospect avenue, Cleveland, O., announces the development of a new No. 311 sign and box receptacle. This receptacle is designed to meet the requirements of Underwriters' rule 83, Sec. D. It does not rotate in the sign metal.

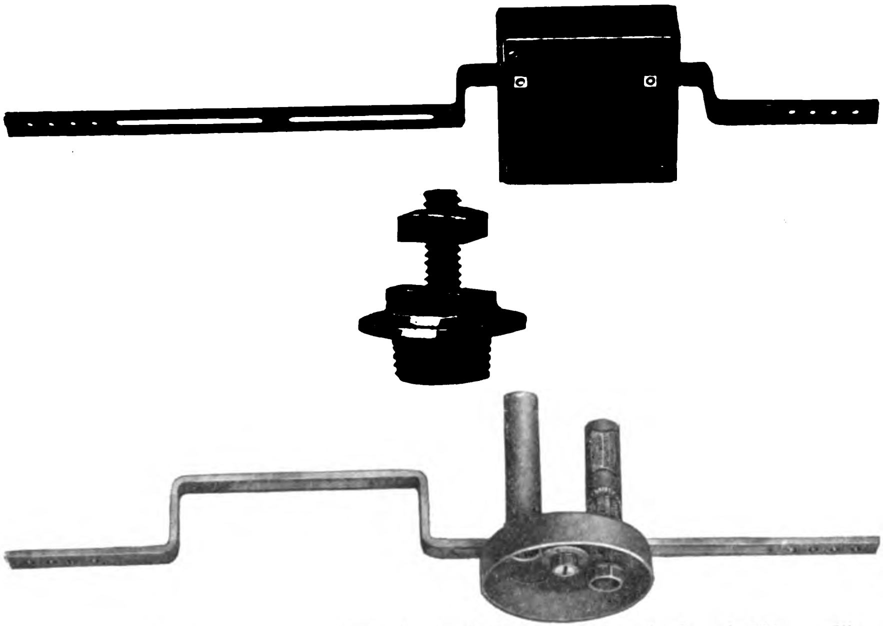
The distance between supporting screw centers is 1 13/16 in. It fits a center hole 1⅜ in. in diameter. The depth inside of box is 1 13/32 in. The unusual feature about this receptacle is its patented metal yoke which avoids broken porcelain ears and also swivels to any desired angle. Two screws provide a proper mechanical connection between the sign metal or box cover and the tapped yoke, thus saving nuts and bushings.

The shell is firmly held by two screws and can be replaced without disturbing the concealed bottom screw terminals.

Austin Safety Stud and Box Hanger

This device is designed to do away with the old style method of nailing a cleat across the joists and the box to the cleat.

The illustrations show this device used in two ways, one with the shallow box, the other with the deep box. It is not necessary to bend the hanger for use with the deep box; simply slip the box into the offset portion and secure with two stove bolts. The shallow box is secured with the safety combination fixture stud and box hanger which slides on the bar and is adjustable to the smallest fraction of an inch, locking the box securely by one bolt from the bottom.

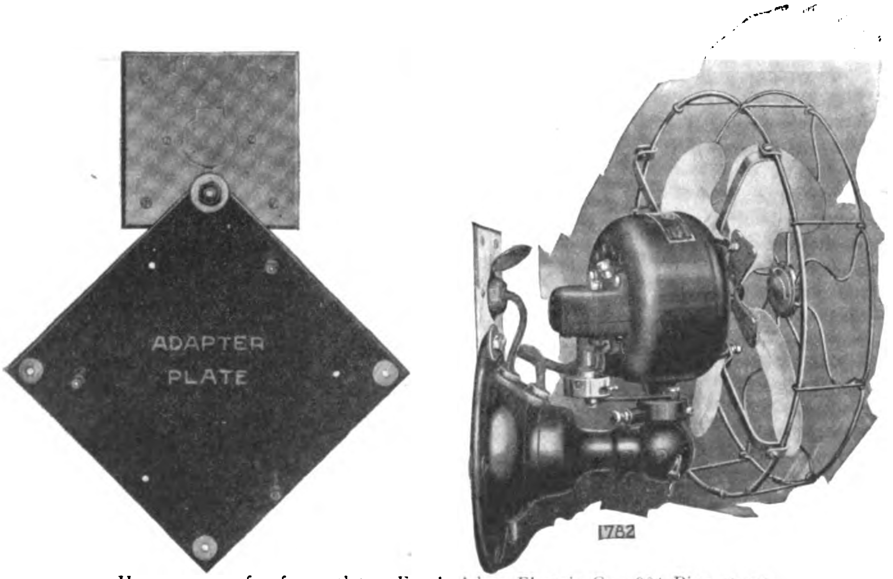


Safety stud and box hanger. M. B. Austin & Co., 700 Jackson boulevard, Chicago, Ill.

It is made by M. B. Austin & Co., 700 Jackson boulevard, Chicago, Ill.

Adam Hanger Cover for Fan Outlets

A device to aid in installing desk or oscillating fans on sidewalls, where the fan is to be regarded as a permanent fixture, is now being offered the trade by the Frank Adam Electric Co., 904 Pine street, St. Louis, Mo. It consists of a special cover for the outlet box. A bolt projecting conveniently from the outlet box cover forms a hanger that passes through the upper screw hole in the rim of the fan base, at the point opposite to the fan switch. A washer and nut placed on the bolt, secure the fan in position, but permit the removal of the apparatus if desired, during the winter months, or for cleaning or repairing. A cord only a few inches in length is sufficient to install fans in this manner. A device of this nature provides a convenient and permanent connection for the fan motor. Its use prevents the disfiguring of walls by screw holes or wooden base boxes.



Hanger cover for fan outlets. Frank Adam Electric Co., 904 Pine street, St. Louis, Mo.

Dallas Sheet Metal Fixture Parts

A. C. Dallas & Son (Inc.), 225 North Jefferson street, Chicago, Ill., have recently placed on the market some fixture parts made of a combination of sheet brass and brass castings. At present the line consists of nineteen designs and combinations.

These fixtures are made of patent level brass so as to avoid the "waves," thus securing a perfectly level surface, and permitting easy and high-grade finishing. By reversing the arms the body can be changed from a shower plate to a candle body. The wiring is easily done, and the body can be suspended from either chain or spindles. The parts are supplied in unfinished, with a smooth surface, or in a variety of finishes, such as Flemish, oxidized silver, oxidized nickel, brush brass and copper, statuary bronze, polished copper, rich gilt, and black and antique brushed copper. The arms and castings are secured with screws and nuts, thus obtaining good joints without the use of solder.

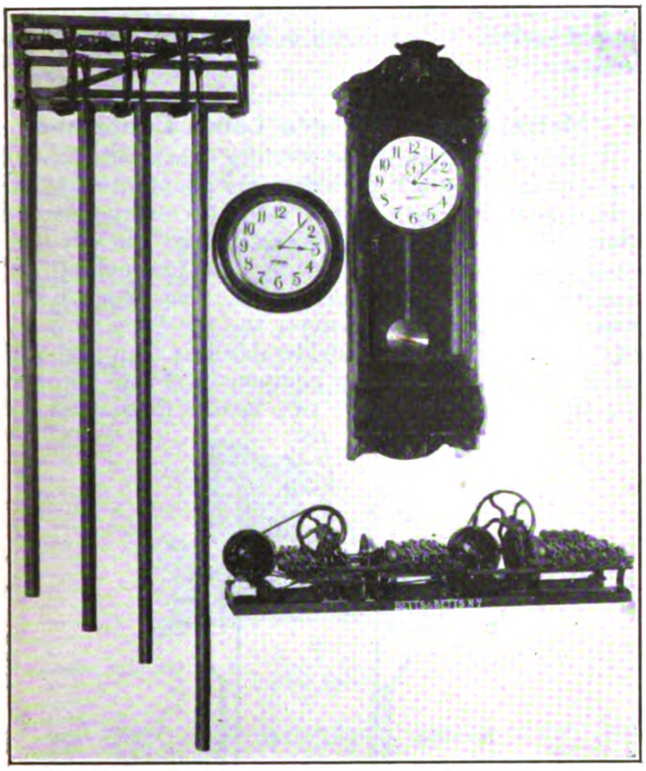
Sheet metal fixture part. A. C. Dallas & Son, Inc., 225 North Jefferson street, Chicago, Ill.

Only the parts can be secured from this concern; it does not supply fixtures, either complete or "knocked down." Dealers and contractors can obtain these parts in large variety and assemble fixture to suit individual tastes.

Dallas & Son have recently issued a catalogue containing illustrations of all the different types of fixture parts made by them. A copy of this catalogue will be sent to any contractor or dealer on request in writing.

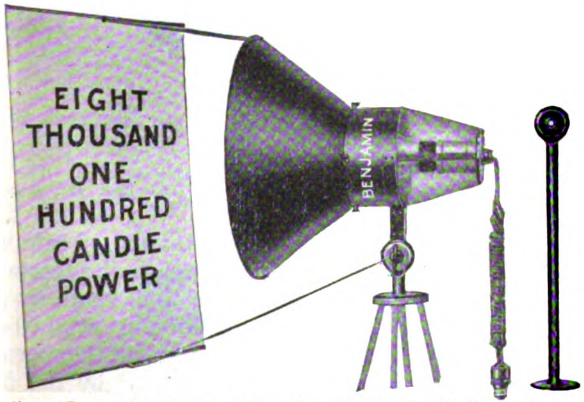
Westminster Chime Outfit

The annexed cut shows a new type of Westminster chime outfit recently brought out by Betts & Betts, Corp., 258 West 55th street, New York. The master "Klok" sends electrical impulses once each minute to the round secondary "Klok" which keeps in perfect step with it. The secondary "Klok" every fifteen minutes sends an electrical impulse to the operating mechanism at the bottom. This plays the chimes and strikes the hour by sending proper electrical impulses to the solenoid magnets which operate the hammers. At the quarter hour the chimes are played once; at the half hour twice; the three-quarter hour three times, and the hour four times, at which time a cord is struck, the number of times corresponding with the proper hour.


Westminster chime outfit. Betts & Betts Corp., 258 West 55th street, New York.

Benjamin Ortholite

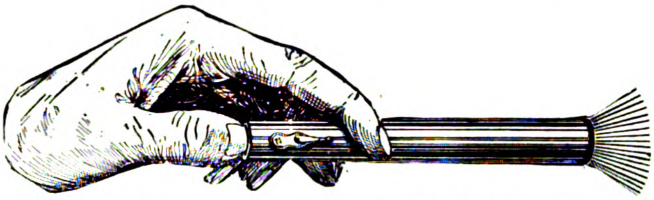
This is a 4-in-1 photographic light for studio, home portraiture, printing, and enlarging. It gives a light rich in actinic rays, the kind of rays a photographer needs most of all in his business. Actinic intensity is a phrase that means short exposure and sharp impression. Being a nitrogen-mazda outfit, it requires liberal ventilation. This feature has been carefully provided for. It prints any size negative up to 11 x 4 inches, and is claimed to be the best possible light for focussing. Equipped with a 1000-watt nitrogen-mazda lamp, it produces 8,100 candle power; with a 500-watt nitrogen-mazda lamp it produces 3,200 candle power. It is made by the Benjamin Electric Mfg. Co., 120-128 South Sangamon street, Chicago, Ill.



Ortholite. Benjamin Electric Mfg. Co., 120-128 South Sangamon street, Chicago, Ill.

"Stayslit" Pocket Flash Pencil

This form of flashlight takes about as much room in a pocket as an ordinary lead pencil, hence its name. The lamp is lighted by pressing a button at the opposite end of the pencil. It has a clip for attaching to the pocket, and it is loaded with a dry battery that is guaranteed to produce 2000 flashes. It is made by Lincoln Electric Heating Appliances, Inc., 112 West Adams street, Chicago, Ill.


"Stayslit" flashlight. Lincoln Electric Heating Appliances, Inc., 112 West Adams street, Chicago, Ill.

Dixon White Porcelain Enamel Fixtures

This line of fixtures is now being marketed by The T. C. White Company, 1122 Pine street, St. Louis, Mo. It includes both indoor and outdoor types for from 200 to 1000-watt lamps. The chief claim of the makers of these fixtures is in the ventilation feature. The top of the socket housing is separated from the globe and fitter by little porcelain bushings. This is said to keep the socket much cooler than a one-piece fixture, or a fixture in which the metal parts of the top are in direct contact with the hot globe or fitter. The ventilation is effected at the neck of the lamp, where the heat is most injurious.

Dixon white porcelain enamel fixture. The T. C. White Co., 1122 Pine street, St. Louis, Mo.

Bed Lite Combination Lamp

Here is a portable lamp that can be readily clamped at any place. It can be firmly attached to woodwork or brass without marring the finish. The lamp is adjustable in all directions, and it will concentrate the light wherever desired. It is primarily, as the name implies, a clamp lamp for the bedstead; but it has an unlimited number of uses. It is finished in brush brass, bronze, hammered brass, and hammered bronze. The outfit includes stand, cord, plug, and shade.

This outfit is now being offered to the trade by the American Electrical Equipment Co., 304 East 10th street, Kansas City, Mo.

Interstate Handy Lantern

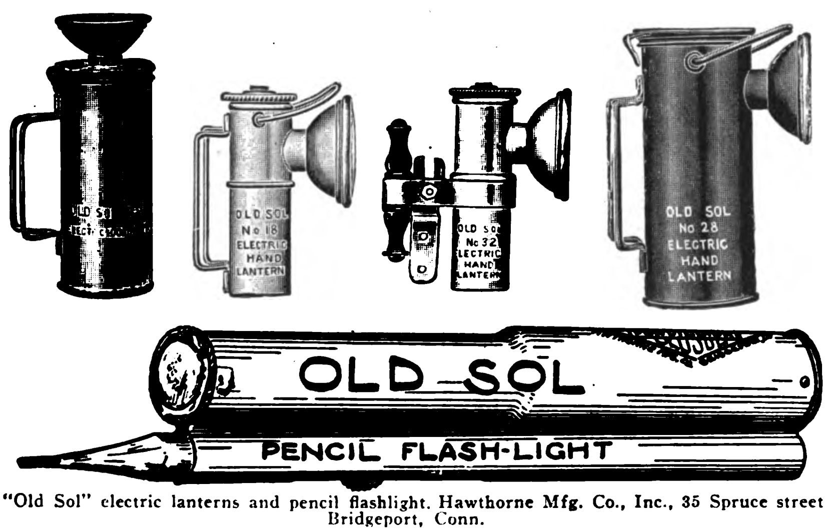
An electric lantern designed on the lines of the familiar lantern carried by trainmen has just been put on the market by the Interstate Electric Novelty Co., 29 Park place, New York. The oil can and wick are replaced by a dry battery and a miniature mazda lamp. The electric energy is turned on and off by means of the small switch shown at the front of the base. These lanterns are fast replacing the older forms. They will "burn" in any position.

Handy electric lantern. Interstate Electric Novelty Co., 29 Park place, New York.

"Old Sol" Electric Lantern and Pencil Flashlight

Under this trade name the Hawthorne Mfg. Co., Inc., 35 Spruce street, Bridgeport, Conn., is offering the trade the two new lighting units shown in the accompanying cuts. The "Old Sol" lanterns are made in several types and finishes. Some are finished in black enamel, some in nickle. Some include the battery, others do not. As in other lanterns of this nature, when the battery is exhausted the lighting fixture can be removed and attached to a fresh battery.

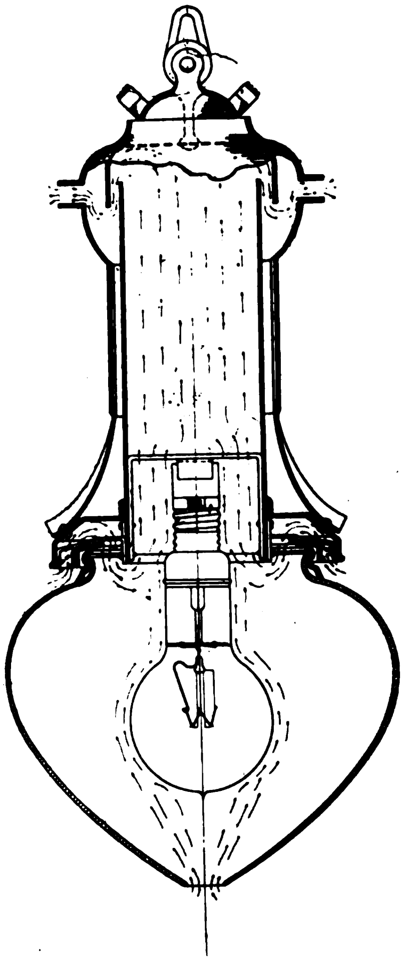
The "Old Sol" pencil flashlight is, as shown, a combination of a pencil holder and a tubular flashlight. It can be readily carried in the pocket. The pencil can be removed at will, and the lamp can be operated with or without the pencil by means of the thumb slide in the pencil barrel. It is finished in nickle, is 5¼ inches long and weighs 3 ounces.



"Old Sol" electric lanterns and pencil flashlight. Hawthorne Mfg. Co., Inc., 35 Spruce street Bridgeport, Conn.

Metropolitan Nitrogen Lamp Containers

The introduction of the recently developed Type "C" (gas filled) lamp and its increasing popularity for street and commercial lighting has made necessary a new design of container for its successful and efficient operation. After many tests made by the Metropolitan Engineering Co., 30 East 42nd street, New York City, it was found possible to convert the arc lamp to a Type "C" lamp container at considerably less than that which would be charged for new equipment. From an operating standpoint there were two factors to contend with, first the absolute elimination of rain water in contact with the lamp bulb; second, so housing or enclosing the lamp that the leading-in wires in the lamp would be operated at the lowest possible temperature. The first was accomplished by the introduction of baffle plates within the housing and so designed as to eliminate the entrance of water and still provide sufficient clearances to permit air-stream

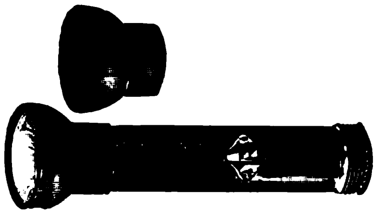


Self-cooling container for nitrogen lamps. The Metropolitan Engineering Co., 30 East 42d street, New York flow with the least possible resistance. The unit depicted in the cross-sectional view in the cut shows the method adopted for taking care of the extra heat developed when this form of lamp is burned tip down.

The design takes the form of a chimney with cold air entering beneath the lamp at the bottom of the globe. This air rises rapidly and becomes heated after enveloping the lamp bulb, passes upward with considerable velocity, and in so doing induces a volume of cold air to enter above the top of the globe as illustrated. This particular cold air stream entering above the globe top and being directed against those lamp parts liable to high temperature causes them to operate at a temperature lower than would obtain if the lamp were burned in free atmosphere.

Flashlight Insulator

The Import Sales Co., 19 East 21st street, New York, has brought out a patent insulator for flashlight cases, one of which is shown in the accompanying illustration. This insulator prevents accidental short circuits of flashlight batteries, and thereby increases the life of the battery and lamp. It is particularly valuable to motorists carrying flashlights in tool boxes or wherever lamp comes in contact with metal. The protector is made of rubber in two sizes; one for the miner's size, and one for the straight fibre cases.



Flashlight insulator case. Import Sales Co., 19 East 21st street, New York.

Majestic No. 2 Electric Heater

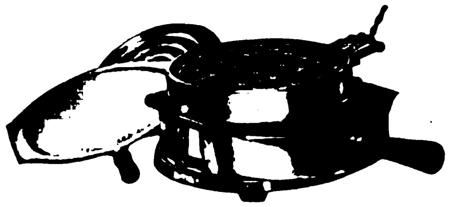
Several new electric heating units have recently been put on the market by the Majestic Electric Development Co., 428 O'Farrell street, San Francisco, Cal. One of them, the "Majestic No. 2," is shown in the annexed cut. The heater is portable, weighing only 4 pounds. It is 15 inches high and has a 6½-inch base. Its energy consumption is 615 watts, or about 5½ amperes at a pressure of 110 volts. It is finished in polished nickel.

Majestic No. 2 heater. Majestic Electric Development Co., 428 O'Farrell street, San Francisco, Cal.

El Grilstovo

The Hotpoint Electric Heating Co., Ontario, Cal., is now marketing a new heating device called the "El Grilstovo." It combines the functions of the electric grill, and stove, and utilizes the principles of the open-coil reflector-type electric stove.

The new appliance, here shown, cooks two articles at once on the same current, one above, and the other below the heating element; using ordinary kitchen utensils above, and a special extra-deep underdish below.



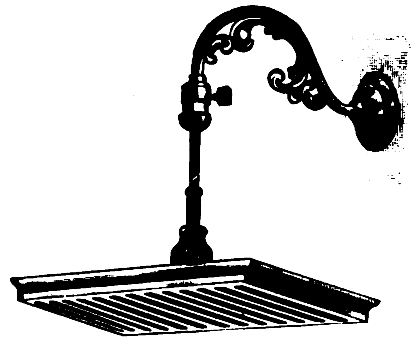
El Grilstovo. Hotpoint Electric Heating Co., Ontario, Cal.

The utility of this device is such as to commend it to those in search of better results in household duties, at the same time lessening the effort required.

Lindstrom-Smith Portable Electric Air Heater

This heater will operate on energy from the regular lighting circuit and it can be attached to any socket like a lamp. It is safe, even in the smallest bathroom.

It is convenient for traveling, being light and compact. It is made substantially throughout of pressed steel, heavily nickel-plated and highly polished. The element is non-corrosive and non-oxidizable. A special reflector intensifies the heat and reflects it downward.



Electric air heater. Lindstrom, Smith Co., Inc., 1100 South Wabash avenue, Chicago, Ill.

This heater is furnished with a cord and detachable plug. It measures 6 x 10 x 1¼ inches, and weighs 2 pounds. It is made by the Lindstrom, Smith Co., 1100 South Wabash avenue, Chicago, Ill.

Elektro Heating Devices

D. C. Hughes & Co., 4642 Ravenswood avenue, Chicago, Ill., have recently marketed a line of electric heating devices including a percolator, a toaster, and a stove.

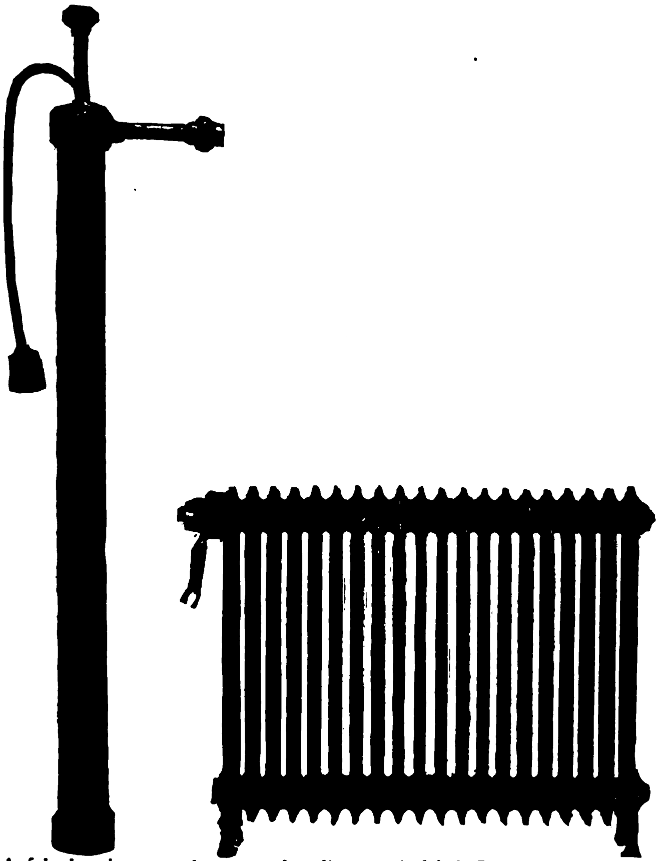
The "Elektro" percolator is made of heavy gage aluminum and is highly burnished. The makers say that no stand or special pad is required, as the base of the percolator never gets hotter than the contents of the pot. It comes complete with an attachment plug, a separable connection plug, and silk covered cord.

The toaster is made with a black enamel base, the rest of it being heavily nickel plated, with a polished steel frame. It is equipped with spring supported doors which are operated by heat-insulated handles. It is also equipped with a separable plug and silk covered cord.

The stove is 6 inches in diameter, nickel plated, and polished. The base is black enameled. The handles are heat insulated so that the stove may be moved about while it is hot. It has triple-heat insulation and may be used directly on the table without causing the varnish to blister.

Apfel Electric Radiator and Water Heater

Two new electric heating devices have recently been put on the market by Apfel & Jansen, 1626 Fourth avenue, Seattle, Wash. Both are shown in the annexed illustrations. The first, a radiator, consists of an ordinary hot water radiator completely filled with a circulating medium which is also insulating, and heating elements which are inserted through the top and the bottom of the radiator. The heating element is divided into several sections, and is connected to a multiple-pole switch which can be attached direct to the radiator, or placed elsewhere if more convenient. This radiator consumes about 30 watts per square foot of radiating surface on high heat, 15 watts on medium heat, and 8 watts on low heat. It can be attached directly to the lighting circuit, insuring immediate local heat at any time.

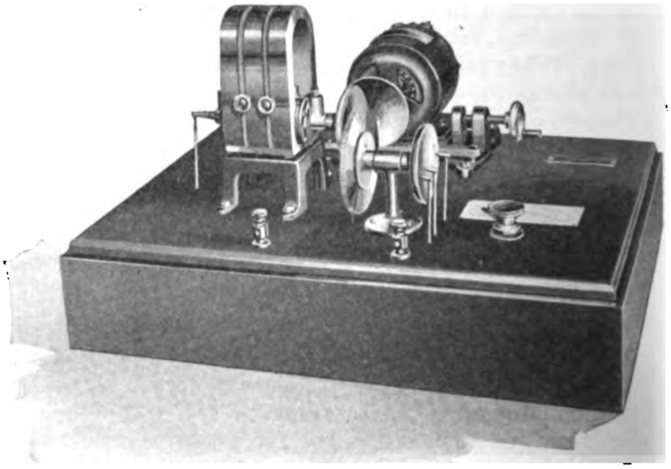

Apfel electric water heater and radiator. Apfel & Jansen, 1626 Fourth avenue, Seattle, Washington.

The electric hot water heater for domestic purposes consists, as shown, of a metal tube containing a high-resistance heating coil. It takes up but little space, 3 inches by 30 inches, and can be installed so as to heat the water in any size tank from 30 to 30,000 gallons.

With the reduced cost for electric service in this part of the country, heating devices of this nature are coming rapidly into favor.

Electrotherapeutic Set

The accompanying illustration shows a novel device for the use of electricity as a therapeutic agent. It consists essentially of a magneto which generates a sinusoidal alternating current, driven by a small motor. Outfits of this nature are used in hospitals and sanitariums for the treatment of neurasthenia, weakness of the abdominal muscles, locomotor ataxia, arteriosclerosis, and other nervous disorders.

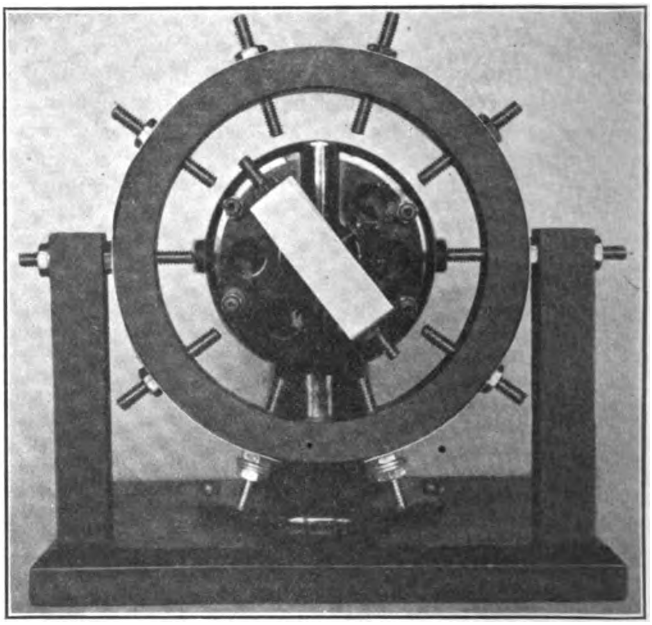

Electrotherapeutic set. Made by Sanitarium Equipment Co., Battle Creek, Mich. Operated by Robbins & Myers motor.

The magneto is driven by a motor made by The Robbins & Myers Co., Springfield, Ohio. The equipment is manufactured and sold by the Sanitarium Equipment Co., Battle Creek, Mich.

Rotary Spark Gap

Among the new devices on the market for use by wireless operators is the new type rotary spark gap shown below. It is made by the Radio Apparatus Co., Parkway Bldg., Philadelphia, Pa.

The motor runs 8,000 r.p.m. on 110 volts alternating or direct. There are ten stationary studs, five in each side of the circuit, and the revolving discharger arm discharges the sending condenser each time a stationary stud is passed. This will give about 1,200 discharges or sparks per second, similar to a quenched spark gap operating on 600-cycle current.


Rotary spark gap for wireless plants. Radio Apparatus Co., Parkway Bldg., Philadelphia, Pa.

It can be used on ¼ and ½-kw. sets in its present size and will be built later for higher powers.

The discharger attains full speed in 1 second and stops dead in 3 seconds. The quick start is necessary to avoid the otherwise comparatively long wait before the operator can commence to send after having once obtained communication with a station.

Davidson Meter Blower

This simple mechanical blower is offered to the trade by the makers as an efficient substitute for the old-fashioned method of clearing the dust out of meters by blowing into them, with the lungs for bellows. The device shown in the cut clears the meter of dust by forcing dry air to all parts of the mechanism, its flexibility allowing it to squeeze into all the odd corners. It is made of soft rubber, and is small enough to go into the pocket. It is made by the Davidson Rubber Co., Boston, Mass. The cut shows the blower full size.

Blower for cleaning meters. Davidson Rubber Co., Boston, Mass.

"Pagrip" Metal Molding

This is a line of metal molding submitted as complying with the requirements of Rule 60 c to h, of the National Electrical Code. It consists of a formed channel with a capping which is gripped between the upper edges of the channel. Fig. 1 shows a cross-section of the molding. Special fittings provided with joints which telescope over the molding and having snap caps are illustrated in Fig. 2.

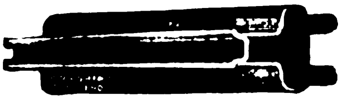


Fig. 1. Cross-section of "Pagrip" molding. O. M. Pague, 226 North Jefferson street, Chicago, Ill.

The molding when assembled has an internal width of 25-32 inch and a depth of 9-32 inch; the backing being of metal 0.050 inch thick and the capping of metal 0.040 inch thick.

A line of fittings consisting of elbows, tees, crosses, junction boxes, and bases for mounting molding fittings at present on the market are supplied by this manufacturer. Each fitting is provided with one or more extension spring clips which telescope the molding base 1⅛ inch, a stop being provided for the molding. Caps for these fittings fit over the extension and engage with a spring action. A tongue on the cap fits in the groove in the capping of the molding.

The molding and all fittings are well sherardized to prevent corrosion.

It is claimed that a saving of at least 25 per cent. can be made in installing this system of that now required to install other similar fittings now on the market.

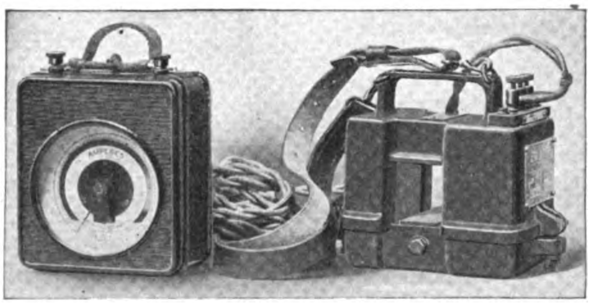
The materials are manufactured by O. M. Pague, a newly organized concern at present located at 226 No. Jefferson street, Chicago, Ill.

Insulating Paint

This paint has recently been put on the market by T. J. Hadley, Brunswick Hotel, Winnipeg, Canada. It is a black liquid, that dries with a gloss finish and remains soft and pliable. It is used for coating wires, cables, splices, and in places where an insulating paint is desirable.

Westinghouse Portable Current Testing Outfit

There are many uses in central station work for a high grade portable current testing outfit that combines accuracy and lightness with low first cost. Such an outfit with a capacity of 75 to 250 amperes is now offered by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. The transformer is so constructed that it can be clamped around any cable or feeder without opening the circuit, and therefore has a wide field of



Portable current testing outfit. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

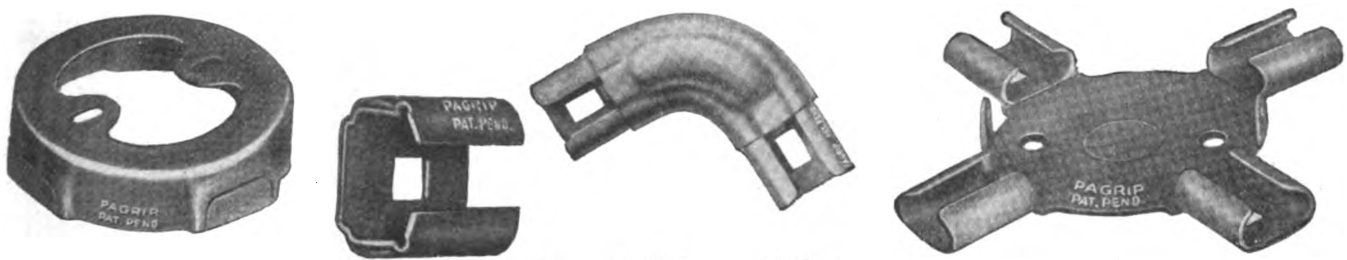


Fig. 2. Some of the "Pagrip" fittings. O. M. Pague, 226 North Jefferson street, Chicago, Ill.

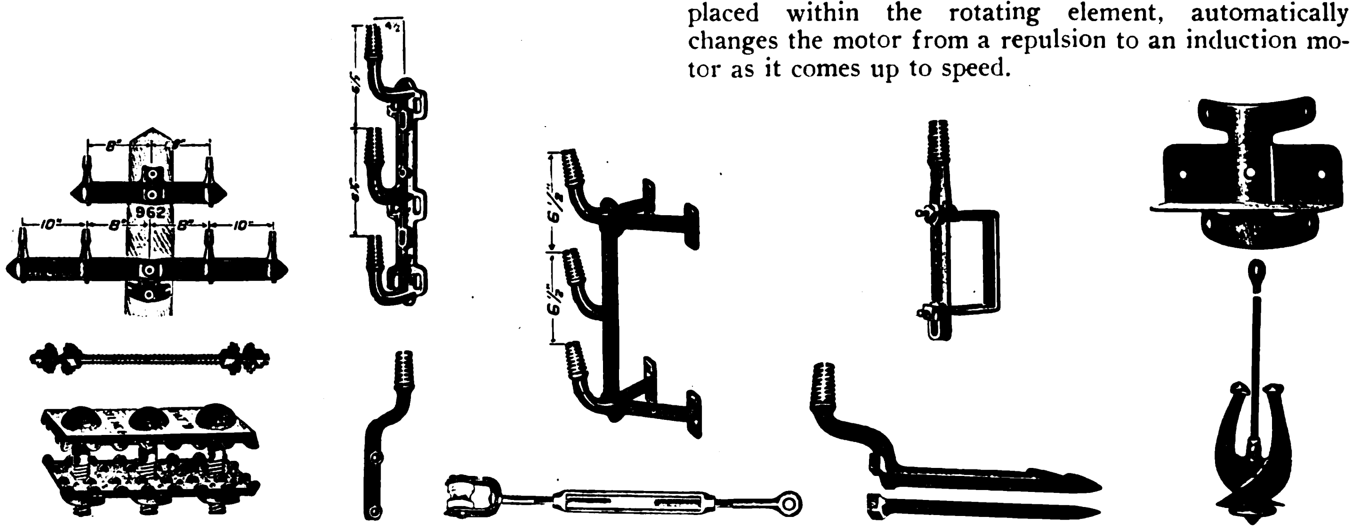
usefulness in testing cables in the power house, in manholes, or on the line.

The standard outfit consists of a portable split-type current transformer, a type PR portable ammeter, a set of leads 10 feet long, and a leather carrying strap. The total weight of the outfit is less than 30 pounds.

The split-type current transformer is made with a clamp at one end and a hinged joint at the other so that the two halves can be opened up, slipped over the cable, and clamped together tightly. The use of this transformer makes it unnecessary to open the main circuit to make a test. By means of binding posts on the transformer, connections can be made for obtaining full scale readings of either 125 or 250 amperes.

Pole and Line Hardware

The accompanying cuts show some of the many new electrical specialties for use by lighting and power companies that have recently been developed and marketed by the St. Louis Malleable Casting Co., 7701 North Conduit avenue, St. Louis, Mo. The recent productions of this company have been developed to meet the demand for fittings designed on a scientific basis instead of in haphazard fashion. All the pins, brackets, and other devices shown are said to have just the amount of material required at any point, the metal being so distributed as to meet the required strain at that point. The extra strain and extra material are thus brought together at the same point at the same time.



Electrical pole and line hardware. St. Louis Malleable Casting Co., 7701 North Conduit avenue, St. Louis, Mo.

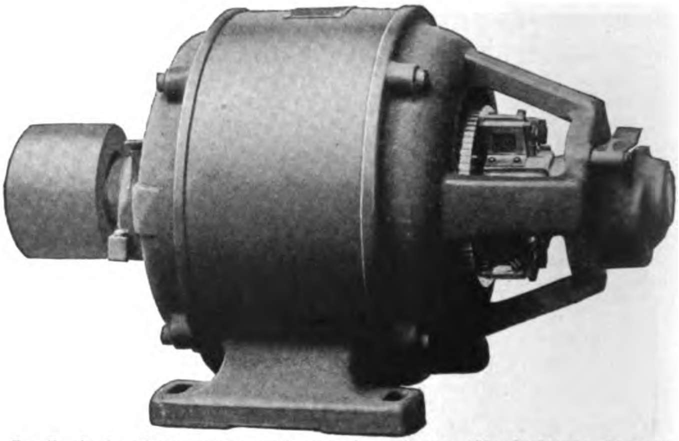
The entire new line of fittings of this nature which are now being marketed by this company is fully illustrated and described in Catalogue No. 400. This catalogue is now being distributed. It will be sent to anyone on request. The lines described in it include anchors, bolts, various kinds of brackets, clamps, cross-arm braces, pins, curve hangers, trolley ears, insulators, and suspension yokes. Some of the new lines are shown in the annexed illustrations.

Westinghouse Type A R Motors

The Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has recently placed on the market a new line of single-phase motors for operating small machines of all kinds. These motors are known as type AR and range in size from ½ to 10 horsepower inclusive, for 60-cycle circuits.

The type of construction is shown in the cut. All sizes of motors can easily be adapted for wall or ceiling mounting and may also be adjusted for right or left running in a moment's time. Any motor may be reconnected externally for operation on either 110 or 220-volt circuits.

The motor starts as a repulsion motor, producing large starting torque and taking only a small starting current. A simple mechanically-operated governor, placed within the rotating element, automatically changes the motor from a repulsion to an induction motor as it comes up to speed.



Small single phase motor with cast iron base. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Ordinarily a double-pole line switch is the only starting device required, although starters can be furnished to further reduce the starting current. These motors can be used upon any single-phase circuit or any phase of a polyphase circuit.

Emerson Family Sewing Machine Motors

Several new types of motors for family sewing machines have just been put on the market by The Emerson Electric Mfg. Co., 2024 Washington avenue, St. Louis, Mo. The alternating current motors have been improved by substituting terminal studs for the terminal plates formerly furnished. All types of motors for both alternating and direct current are now furnished complete with a 10-foot reinforced cord, cord switch, and Benjamin No. 903 attachment plug. A cleat and screws are provided for fastening the cord to the under side of the table of the sewing machine, thus bringing the switch within convenient reach of the operator's hand.

All styles of attachments offered with these motors are so designed as to place the motor below the table, out of the way, so that there is no danger of soiling the work with oil from the bearings of the motor, and no likelihood of the operator's hand coming in contact with the motor terminals.

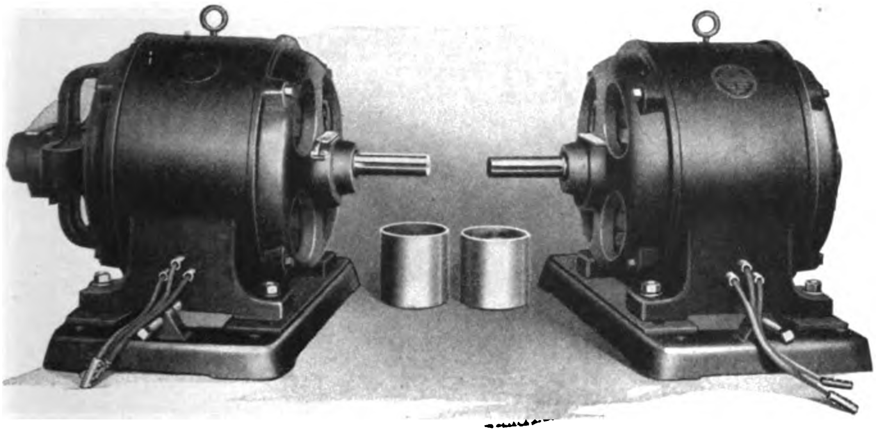
A slight pressure on the treadle starts the machine. As pressure is increased the speed increases. Releasing the treadle operates an automatic brake which stops the machine promptly. It is not necessary for the operator to hold one hand on the flywheel to stop the machine at a given point.

Motor for operating Singer "wide-stand" drophead machines. The Emerson Electric Mfg. Co., 2024 Washington avenue, St. Louis, Mo. The sewing machine head may be raised or lowered as usual by slipping the belt off the motor pulley before raising the head.

These motors operate on 110 volts. The alternating current motor operates at a frequency of 60 cycles.

Wesche Uniframe Motors

The B. A. Wesche Electric Co., 327 East Sixth avenue, Cincinnati, O., has designed a line of direct current motors having the same dimensions as to base drilling, height to center of shaft, diameter of shaft, shaft extension for pulley, bearings and size of frame as their alternating current motor of corresponding horse power and speed rating. This has been accomplished by the use of a new frame having the exact outside dimensions of the alternating current frame and a new bracket for the commutator side of the direct current machine that could be used for the slip ring side of the alternating current wound rotor type as well.



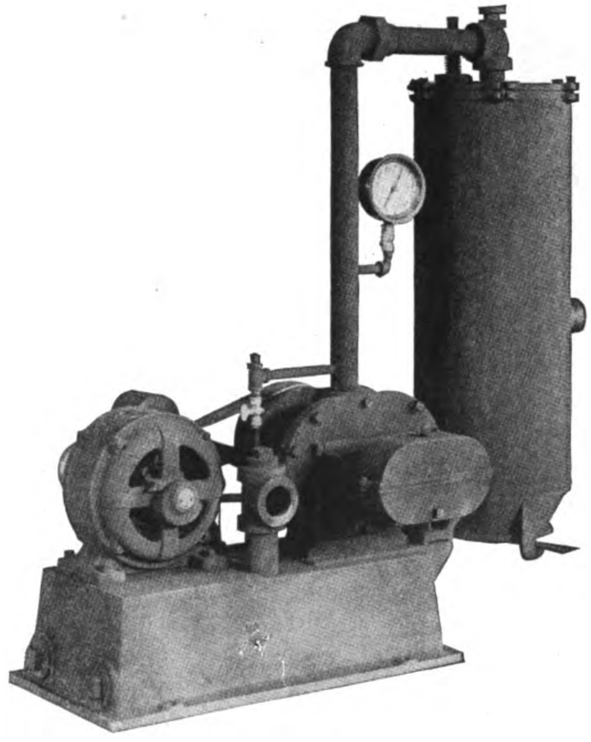
Uniframe motors. B. A. Wesche Electric Co, 327 East Sixth avenue, Cincinnati, Ohio.

This feature enables the motor manufacturer to reduce the number of patterns, jigs and gauges and at the same time increase the number of parts interchangeable between the two lines. It also permits changing from a direct to an alternating current motor, or vice versa, on direct driven apparatus.

These "Uniframe" motors, as the makers call this new line, are built in standard sizes from ¼ h.p. to 50 h.p. either 2 or 3 phase, 60 cycles, 110, 220, 440, or 550 volts alternating; and in corresponding horse power and speeds, shunt or compound wound, 110, 220, or 550 volts direct.

Atwood Vacuum Cleaner

The cleaner shown in the cut is suitable for the average residence or apartment. It represents the latest development of the Atwood Vacuum Cleaner Co., of Rockford, Ill. The vacuum is obtained by a motor driven exhauster operating on the principle of the two-shaft positive blower. It consists of two shafts, each carrying an impeller similar to a two-toothed gear. These impellers turn in opposite directions and operate with a slight clearance on all sides which is sealed by water drawn from and afterwards returned to a reservoir in the base. The bearings have unusually large wearing surfaces. The two bearings on each side are set in a large oil chamber which permits easy inspection upon lifting a hinged cover.



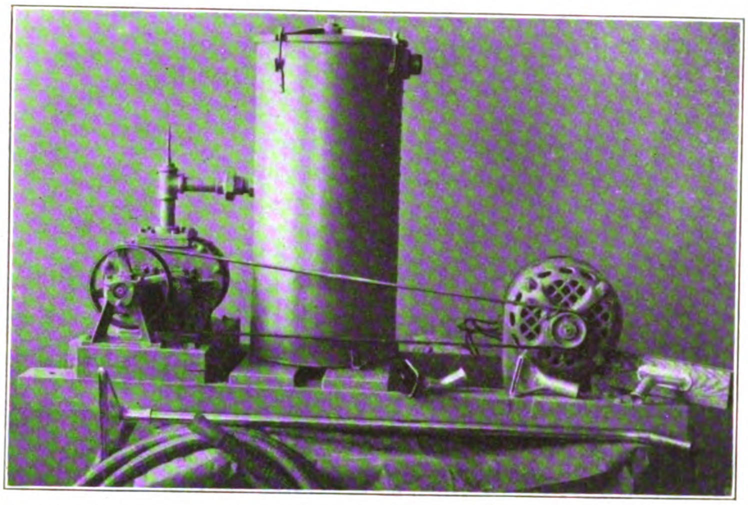
Stationary vacuum cleaning apparatus. Atwood Vacuum Cleaner Co., Rockford, Ill.

A Westinghouse motor is belted to the exhauster. The one shown in the illustration is a ½ h.p. alternating current motor and is fitted with a clutch similar to the multiple-disc type used on many well known automobiles.

This cleaner may be located in the basement or other convenient place, and the piping extended throughout the house. The dust and dirt are sucked into the large container shown on the right.

Monarch Stationary Vacuum Cleaner

In desiging the Monarch stationary vacuum cleaner it has been the makers' aim to do away with all complex and unnecessary parts. It is equipped with a powerful positive vacuum rotary pump. The bearings have ring oilers, requiring little attention. The tank and dust sack are of liberal capacity, and the dust sack is easily removed for emptying. The electric motor is of ½ h.p. capacity. The equipment includes 30 feet of vacuum hose and all necessary cleaning tools. This cleaner is made by Guelson & Wathe, 203 West Fifth street, Mason City, Ia.

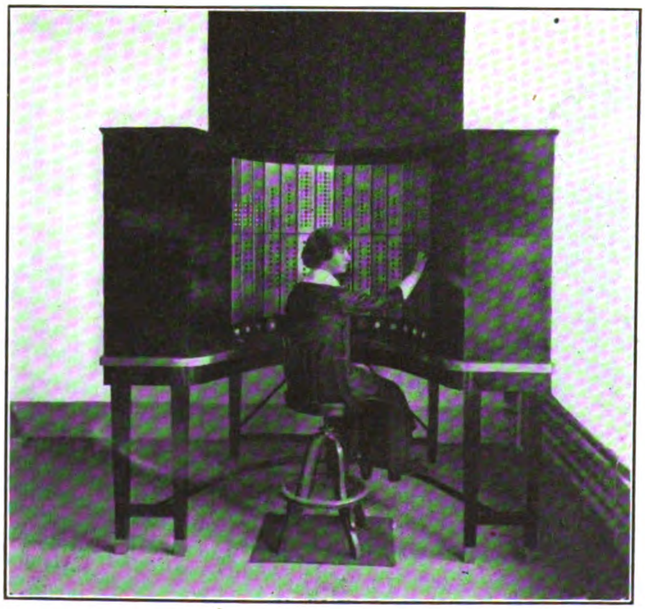


Monarch stationary vacuum cleaner. Guelson & Wathe, 203 West Fifth street, Mason City, Iowa.

Control Board for Electric Dumbwaiters

There are fourteen electric dumbwaiters in various parts of Altman & Company's shop, Fifth avenue, New York, and all are controlled from one central station, as shown in the annexed cut. The stand is of steel with mahogany finish, and was made by the Art Metal Construction Co., of Jamestown, N. Y.

There is one vertical panel of control buttons and lights for each dumbwaiter. The round bull's-eye at the bottom of each panel is the pilot light for that dumbwaiter, which shows whether the dumbwaiter is in motion or closed. The buttons at the right hand side of the lower half of each panel are the controlling buttons for dispatching and calling the car, and the buttons at the left hand are the signal buttons. Each button is connected to a buzzer at its proper floor and the operator signals that the car is coming or that a door has been left open.



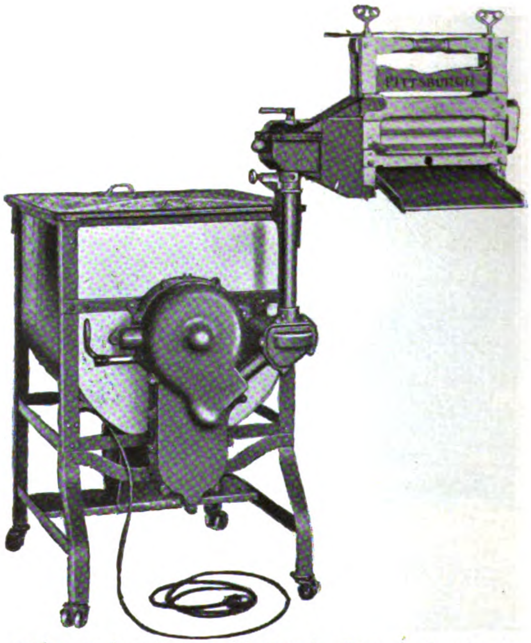
Push button dumbwaiter control in Altman & Co., store, Fifth avenue, New York.

In the upper half of each panel are three vertical rows of lights, red ones in the center and white ones at each side. The red lights are a position indicator and show the location of the car at all times. The lights on the right hand side are the "call" signal lights. There is a button at each floor connected to its proper light and the attendants at the floor thus signal that the dumbwaiter is wanted. These call lights are so arranged that when the dumbwaiter car is sent to a floor, it automatically cancels the call light of that particular floor; but if there should be any other calls the lamps remain lighted and are only extinguished after the car has been sent to the other floors calling. The lights at the left hand side are the "send" signal lights and are connected to a bank of buttons in the dumbwaiter car itself. They are used in inter-floor service; that is, the attendant on the floor will call the car to that floor, and when it arrives place the package therein and by means of these buttons and lights, signals to the operator the floor at which the package is to be delivered. These lights are also arranged automatically to cancel themselves as soon as the car is sent to the floor wanted.

The control board and dumbwaiters were installed by the Burdett-Rowntree Mfg. Co., and all of the dumbwaiters are operated by one girl.

"Pittsburgh" Electric Washer and Wringer

A new and improved type electric washer and wringer is now made by the Pittsburgh Gage & Supply Co., Thirtieth street and Liberty avenue, Pittsburgh, Pa. In this washer all moving parts are enclosed. The tub is of copper, tinned inside. There are two sizes of machines: No. 1, capacity 8 sheets; No. 2, capacity 14 sheets.



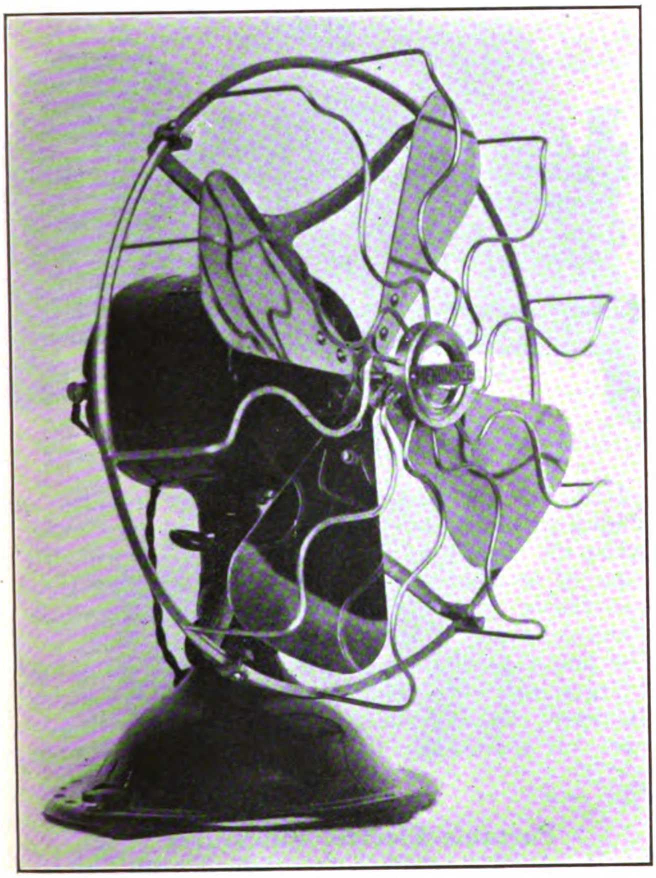
Electric washer and wringer. Pittsburgh Gage & Supply Co., 30th street and Liberty avenue, Pittsburgh, Pa.

The clothes are put into a perforated zinc cylinder which revolves and reverses; the hot water and suds are forced through the meshes of the clothes, and all dirt removed without any rubbing or wear on them.

A feature of this machine is the reversing and swinging wringer which is of heavy construction, well braced, and cannot sag out of shape. The wringer can be swung around to three different positions so that washer does not have to be moved or heavy clothes lifted. It is equipped with a sliding drip board, and there is a safety release to prevent accidents. Both wringer and washer can be operated at the same time.

Menominee 12-inch Universal Fan

The long looked for 12-inch fan that would operate equally well on either direct or alternating current has at last come out of the experimental room. A brand new fan of this type is announced by the Menominee Electric Mfg. Co., of Menominee, Mich. It is shown in the annexed illustration. The details as to dimensions and finish are not available at this time.



Menominee 12-inch universal fan. Menominee Electric Mfg. Co., Menominee, Mich.

Temco Portable Electric Drills

These drills have the general shape of an ordinary breast drill, and are light in weight. The weight is well balanced, making handling easy. The electric switch is conveniently placed near the handle.

The two principal sizes are Model B and Model C, the former having one motor and the latter having two motors, making it especially adapted to the hardest kind of work. Model B has a capacity up to and including ⅜ inch in steel, cast iron or similar substance and weighs only 12 pounds complete. Model C has a capacity of ½ inch in steel, has two speeds, and weighs without the chuck, about 19 pounds.

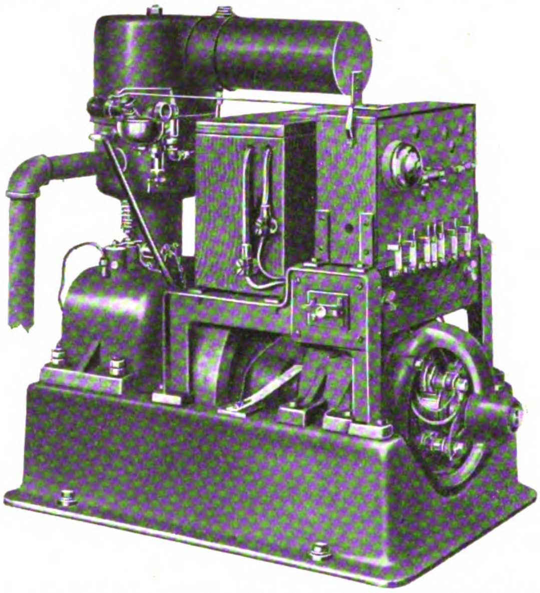
This line also includes a tool post grinder, a valve grinder for automobile engines, and a buffer and polisher. All are made by the Temco Electric Motor Co., Leipsic, Ohio.

Jones' Isolated Plant

This small lighting and power plant runs 30 electric lights of 20-c.p. each, located wherever you want them in your home. It runs the equivalent in fans, motors, flat irons, or electric cooking utensils. It is made by the L. B. Jones Co., 3101 East 15th street, Kansas City, Mo.

The complete plant is mounted on one base measuring 22 by 32 inches. It is a compact system, including briefly, a gasoline engine which runs on the same shaft with an electric motor-generator, an electric storage battery and a controlling switchbox. It is 35 inches high over all, and weighs 725 pounds. It is self-regulating.

With gasoline at 15 cents a gallon this plant will supply current for a variety of purposes in home, barn, garage, or outbuildings at 2½ cents a kilowatt-hour. The makers say it will run the lights for three nights in the average home on one gallon of gasoline.



Jones system of generating electricity for use in places beyond the zone of central station service. L. B. Jones Co., 3110 East 15th street, Kansas City, Mo.

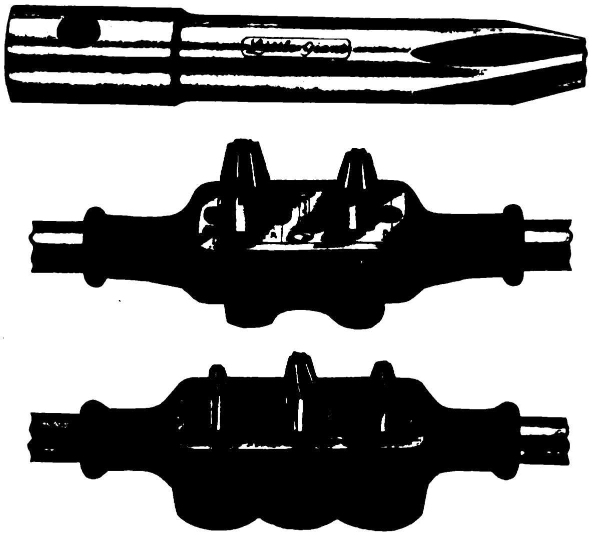
The engine has a 3-inch bore and 4½-inch stroke, operating on four cycles. The generator has a capacity of 750 watts, or 23½ amperes full load at a pressure of 32 volts. The storage battery contains 12 cells. The controller makes the plant self-regulating, the pressure being kept constant at 32 volts.

Internal Guide for Pipe-Threading Tools

This attachment for pipe-threading tools is now being offered to the trade by the Greenfield Tap and Die Corporation, of Greenfield, Mass. The makers feel that it makes for an epoch in the pipe-threading field.

The internal guide takes the place of the various forms of external or bushing guides which have been the only method heretofore of guiding the dies in pipe stocks for a straight thread. It also has the additional virtue of reaming the burrs from the inside of the pipe as it enters, thus doing two operations in one. This feature saves expense in tool equipment; it also saves time and effort.

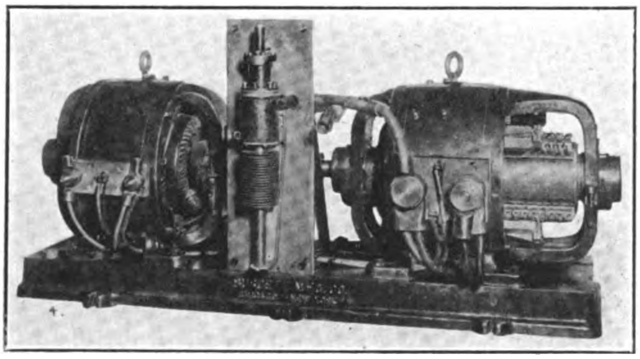
The "Trio" pipe stock, made by this concern, which contains three different cutting sizes of "Little Giant" dies is now fitted with this form of guide, as is also its companion, the "Duo" pipe stock, which contains two cutting sizes. The makers say that in the case of the Trio stock, this one tool takes the place of seven distinct tools that would otherwise have to be used; viz., three stocks and dies, three burring machines, and one tap and reamer wrench.


Internal guide stocks. Greenfield Tap & Die Corporation, Greenfield, Mass.

In addition to the Trio and Duo pipe stocks, above mentioned, the internal guide is also fitted to the pipe-threading sets for ceiling work, the ratchet pipe stock and, in a modified way, to stocks and dies for threading thin metal tubing.

Roth Motor-Generator Set With Merrill Regulator

A novel motor-generator set equipped with a Merrill regulator has recently been developed by Roth Bros. & Co., Adams and Loomis streets, Chicago, Ill. The set is for use in conjunction with cells for generating gas used in oxy-acetylene welding. The set of cells with which the motor-generator is being used operates most efficiently at 400 amperes and 190 volts. The customer has available 230 volts direct current from the central station supply mains. Under ordinary circumstances it would be necessary for him either to waste the difference between the 190 volts and the voltage of the power circuit in a resistance, or to purchase a 76-kw. motor-generator set consisting of a 230-volt motor and a 190-volt, 400-ampere generator.

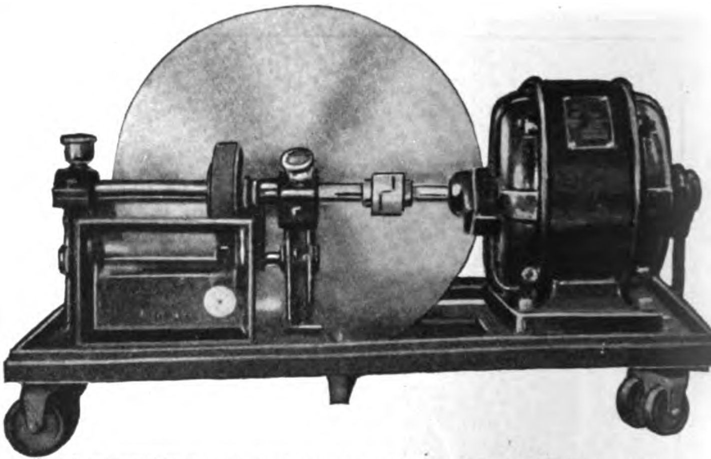

Motor-generator set equipped with Merrill regulator. Roth Brothers Co., Adams and Loomis streets, Chicago, Ill.

By properly designing this motor-generator set and using a properly designed negative regulator, it was possible to use a 13-kw. motor-generator set. This effected a saving of about $1,000 in the first cost and will save about $500 per year in operating cost.

This same style of motor-generator set can be used efficiently and with similar saving in any case where it is desired to get a secondary direct voltage anywhere between 50 and 100 per cent. of the supply line voltage. This is often desired especially in charging batteries; and by properly proportioning the regulator tapered charge can be obtained with the set.

Peerless Portable Power Plant

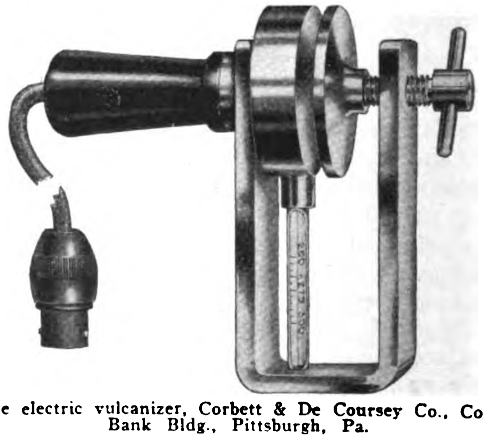
The "Peerless" portable power plant shown herewith is said to combine all the virtues of a drill press and a stationary grinder. It also has features that make it suitable for many applications where these tools could not be used. The complete plant consists of a revolving tool bit socket mounted on the end of a flexible shaft which is driven by a Westinghouse motor through a variable speed friction disc device. Adjustment is provided to take up wear on the driving disc and to vary the contact between the discs for various classes of service. By the use of attachments, eighteen speeds ranging from 165 to 3200 r. p. m. can be secured for grinding, drilling, and polishing.


Peerless portable power plant, cover removed. Operated by Westinghouse motor. Made by United Mfg. Co., Kansas City, Mo.

The power plant is built in sizes from ¼ to 1 h.p. The largest size will accommodate drills up to 1½ inches in diameter. Flexible shafts range in length from 5 to 10 feet. It is made by the United Mfg. Co., Kansas City, Mo.

Portable Electric Vulcanizer

The Corbett & De Coursey Co., Columbia Bank Bldg., Pittsburgh, Pa., has brought out a portable electric vulcanizer to operate on a 6-volt storage battery. It is furnished complete with 6 feet of flexible reinforced


Portable electric vulcanizer, Corbett & De Coursey Co., Columbia Bank Bldg., Pittsburgh, Pa.

cord and a bayonet type plug which may be attached to the exploring or regular lamp socket. The vulcanizer costs virtually nothing to use, as it takes less current to operate than does the actual lighting of the car.

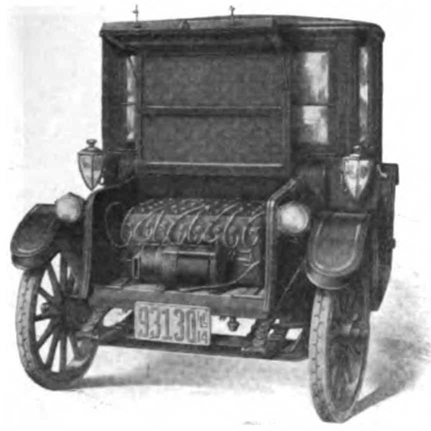
The total weight including serviceable canvas bag is only 2 pounds. It takes up but little room, and may be carried in the tool box.

A standard thermometer with which it is equipped allows the heat to be maintained constant at 275 degrees. A patch can be vulcanized out on the road as well as in the garage without danger from flames or inconvenience from fumes and smoke.

Ellington Unit Charger

This device consists of an electric motor operating on either 110 or 220-volt, 60-cycle alternating current and a direct current generator which charges the storage batteries used in motor car service. It is installed on a motor car as part of its permanent equipment.

A car equipped with this device carries its charging station along with it. It makes the car independent of the charging fees exacted by garage operators, the only requirement being a service that furnishes 110 or 220-volt, 60-cycle, alternating current. The battery charging is tapered, insuring economy and efficiency. And the charger is self-regulating.



Ellington unit charger installed on motor car. The Ellington Electric Co., Quincy, Ill.

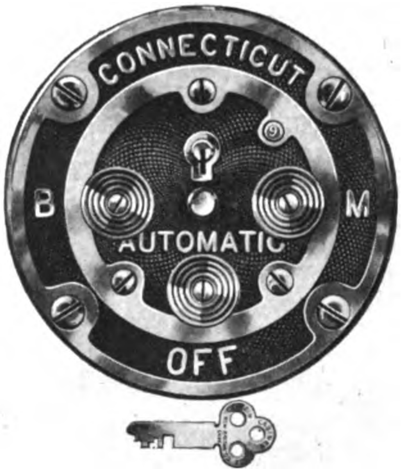
Starting of the set is effected by inserting the supply plug, and turning indicator on control box to point marked "start." This operation closes the field circuit of the generator, and then throws the armature in the circuit, which causes the generator to revolve as a motor from the batteries of the vehicle, and starts the alternating current motor. Indicator is then turned to point marked 110 or 220, depending upon supply voltage, the motor picking up the load, and driving the generator.

In charging from a lighting circuit, the windings on motor are thrown in parallel, and resistance is inserted in field of generator, to decrease load on line to practical rate.

It is manufactured by The Ellington Electric Co., Quincy, Ill.

Connecticut Automobile Lock

The Connecticut Telephone & Electric Co., of Meriden, Connecticut, has just placed on the market a new type of lock as applied to its automatic switch controlling its automatic igniter system.

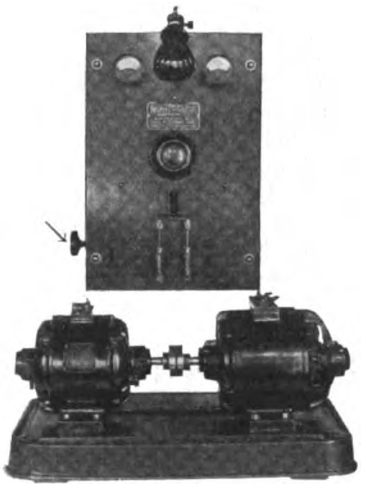


Ignition switch lock. Connecticut Telephone & Electric Co., Meriden, Conn.

This lock is different from the ordinary ignition lock in that the key is required only to unlock it, the switch being locked by means of a small plunger directly over the right-hand button. With this arrangement, it is possible to carry the ignition key on a bunch as it is not necessary to leave it in the lock when the car is being used. In order to operate the locking feature, just press the small button after the switch button has been released and the ignition shut off. It is so designed that it is not possible to lock the ignition until it has been thrown off. The keys are not interchangeable.

Motor-Generator Outfit for Charging Storage Batteries

The outfit shown in the annexed cut has recently been developed by the Independent Electric Machinery Co., 1913 Central street, Kansas City, Mo. It is designed for use by garage men outside the large cities.



Storage battery charging outfit. Independent Electric Machinery Co., Inc., 1913 Central street, Kansas City, Mo.

The increased number of storage batteries in use, providing a profitable business in recharging or repairing, accounts for the development of this device.

This set will charge at one time from one to eight-6-volt batteries at 4 to 12-ampere rate. Will also charge 12, 18, or 24-volt batteries. It has a wide range of adaptability, operates with a minimum of attention, the charging rate being varied through a special type of charging rheostat mounted on the rear of the board.

Electric Specialty Charging Unit

Like other devices of a similar nature, this charging unit consists of a direct current generator wound for any voltage that might be required, and a motor wound so as to operate on either direct or alternating current. The characteristics of the motor harmonize with those of the energy supply circuit as regards phase, voltage, and frequency. Both generator and motor are operated as a solid unit, the two armatures being mounted on one shaft supported by large oil ring bearings at either end. This unit is used for charging small storage batteries and for operating signals. It is built in three sizes, rated at 75, 150, and 300 watts, respectively. The annexed cut shows an alternating current to direct current set. This unit is now being marketed by the Electric Specialty Co., of Stamford, Conn.

Motor-generator set for starting and igniting. Electric Specialty Co., Stamford, Conn.

Packard Armored Cables

Armored cables for use on motor cars and motor boats have recently been developed and marketed by the Packard Electric Co., Warren, Ohio. These cables are doubly protected. The insulating material and braids are impregnated with Packard enamel, which prevents the destructive action due to oil; and over the braids there is a flexible metal sheet wound on in ribbon form. The company is prepared to furnish cables with three kinds of armor—nickel brass, plain brass, and rustproof steel. Any desired combination of insulating materials can also be furnished. In the single conductor type this company carries in stock as standard products, cables ranging from No. 18 to No. 00, inclusive; in double conductor, from No. 18 to No. 8, inclusive.

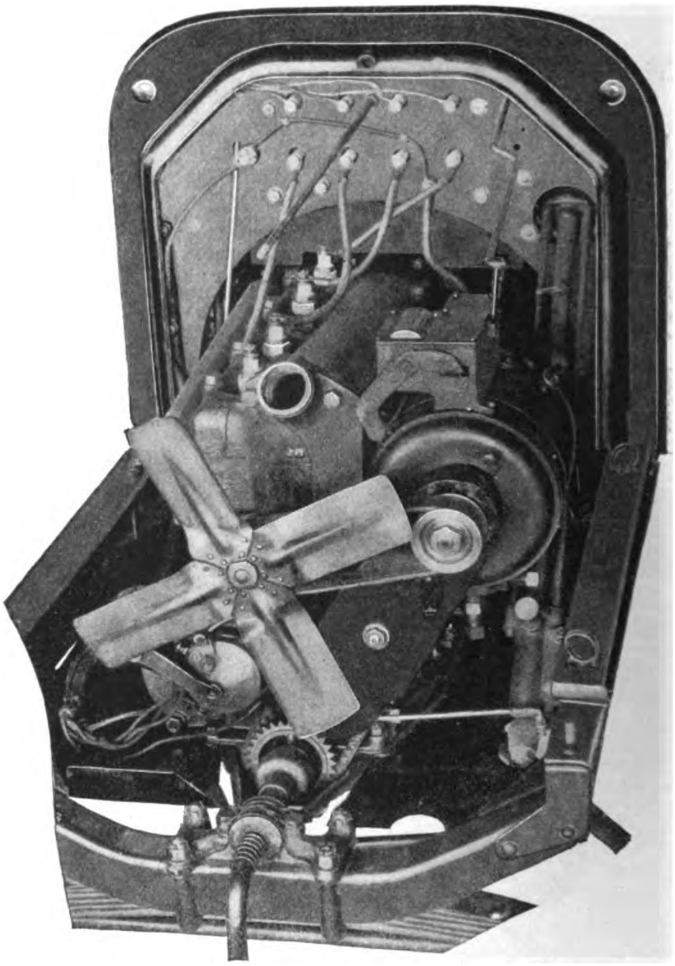
Genemotor—Self-Starting and Lighting System for Ford Cars

A new self-starting and lighting system for use on model T Ford cars, has recently been put on the market by the General Electric Co., of Schenectady, N. Y. It is called the "Genemotor System."

The principal mechanism of the system consists of a single electrical unit, wound for 12 volts, which operates as a generator or a motor as the case may be, and the necessary accessories for attaching to and operating on the Ford car. A 6-cell, 42-ampere-hour battery is included in the equipment. The outfit thus combines the functions of a generator, which furnishes the primary current required for starting the car and operating the head, side, and tail lights, as well as those of a motor for spinning the engine.

The Genemotor is fully enclosed, about 10 in. long overall, 7 in. diameter, and weighs about 52 lb. It is supported rigidly on the right-hand side of a Ford engine, viewed from the front, by a pressed steel bracket secured at three points.

As a motor, the Genemotor will develop a torque of about 45 foot-pounds. The torque developed at the engine shaft by means of the selected gear ratio has been found amply adequate to start a Ford car under very severe conditions of tight adjustment in the engine and cold weather. The storage battery is carried on the right-hand running board of the car, and is employed to accumulate current while the car is in motion for supplying the starting and lighting system when the car is at rest.



Genemotor—self-starting and lighting system for Ford cars. General Electric Co., Schenectady, N. Y.

When the car has attained a speed of about 11 miles per hour, the Genemotor, acting as a generator, develops an electromotive force sufficiently high to overcome the normal voltage of the battery and permits charging to take place. At this point, the reverse current relay operates, closing the circuit between the generator and battery, and charging begins at a low rate, the current gradually increasing as the speed of the car increases until the current reaches a maximum of slightly over 10 amperes.

The sale of this system will not be conducted by the General Electric Co., but will be left to A. J. Picard & Co., 1720 Broadway, New York.

AUTOMOBILE MATTERS

ELECTRIC VEHICLES—ELECTRICAL APPLIANCES FOR CARS, TRUCKS, AND GARAGES—NEWS AND ITEMS ABOUT THIS ACTIVE BUSINESS.

On April 14, by a vote of 27 to 18, the New York Senate passed the Thompson Bill, placing jitney buses under the supervision of the Public Service Commission. Under the provisions of this bill, jitney bus companies, before beginning operation, must secure not only the consent of the Board of Estimate, but also a certificate of convenience and necessity from the Public Service Commission. The roving jitney will not be compelled to seek the consent of property owners along the paths it proposes to travel.

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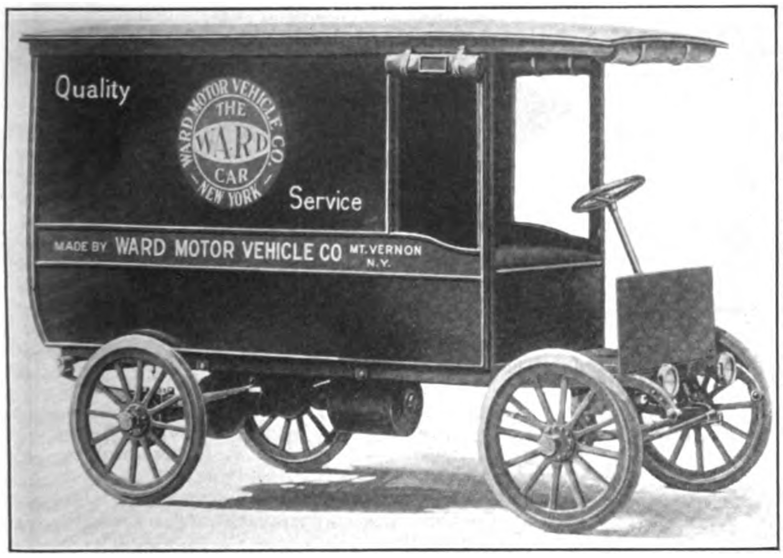
Central station operators will note with much interest that the Ward Motor Vehicle Co., South Fulton avenue, Mt. Vernon, N. Y., has brought out a low priced electric delivery wagon, complete with battery and body. The equipment includes Timken axles, Westinghouse motors, Firestone tires, and Philadelphia storage batteries. The cost of both wagon and specially designed charging outfit is less than half of that ordinarily charged for modern electric vehicles. The charging outfit is so designed that on 60-cycle, 220-volt, single-phase circuits it will give a tapering charge to the battery without manual adjustment or manipulation of any kind.



Electric delivery wagon. Ward Motor Vehicle Co., Mt. Vernon, N. Y.

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The apparatus which has frequently been used for charging in the private garage, says J. F. Lincoln, is the mercury arc rectifier. This instrument depends for its converting properties on the valve like action of a glass tube with the proper electrode which allows current from an alternating current source to flow in one direction only. This instrument has been carefully developed by two of the largest electrical manufacturing concerns in the country, is of neat appearance, of high efficiency and, except for the fact that its voltage and current characteristics are not best suited to the charging of lead batteries, has considerable application. The glass tube of the rectifier deteriorates with use and must be periodically renewed. The rectifier cannot be used with the usual size of pleasure car battery at the rates at which the charge should be furnished or at which the overcharging should be given. A rate of 10 or 12 amperes is the lowest stable rate which the tube will maintain under the usual voltage conditions as found in usual residence districts.

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The Standard Electric & Construction Co., Waterloo, Iowa, has recently opened up an electrical contracting establishment with a complete battery repair and charging department. In the charging department they have two gasoline engines running one 5-kw. and one 10-kw. generator for charging automobile starting and lighting batteries.

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The operation of jitneys in competition with street railways has cut deeply into the earnings of the railways, an example being in Birmingham, Ala. Officers of the Birmingham Railway, Light and Power Company say that the jitneys are carrying on an average of 9,500 passengers a day and depriving the street railway company of $500 in fares daily. Alabama is now considering the passage of a law to regulate the jitneys and protect the street railways.

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"Roadside Kinks," published by the Southern California Edison Co., tells the company's drivers what to do when the engine won't start, when the engine gets hot, when the clutch slips, when a tire blows, and when the last inner tube is punctured. A copy of these kinks should be in the pocket of every driver of a car, whether that car is used for commerce or for pleasure.

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Among the new serviceable electric appliances for use in connection with electric cars are several forms of chargers. The charger consists of a simple form of motor-generator in which the motor takes energy from the line at normal pressure and then converts it, by means of the generator at the other end of the shaft, to energy at a suitable pressure for charging the storage battery. These chargers are designed so as to transfer the energy from the line to the battery without the battery "gassing." This is accomplished by providing means for automatically reducing the rate of charge as time goes on. The charge starts at 35 amperes, drops rapidly to 20 amperes, and then to from 3 to 7 amperes.

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It is said by those who know that solid tires last longer and therefore give greater mileage when used on electrics than they do on gas cars. The size of the tire should be carefully selected so as to adapt it to the average load the car is to carry.

MOTOR MARKETS

USES FOR MOTORS, GROUPED ACCORDING TO STATED HORSE-POWER LIMITS.

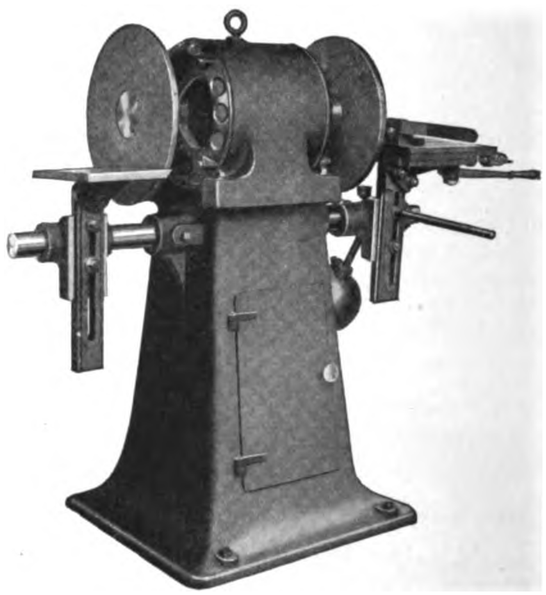
Motors of from 1½ to 5 Horse Power

[MOTOR DRIVE SERIES—ARTICLE NO. 42]

Three hundred devices capable of being individually driven by motors of from 1½ to 5 horse power are listed in the accompanying table. It will be noticed that a number of devices mentioned in the previous article as being capable of operation by from ⅓ to 1 horse power motors are included in this list. The reason is that the same device in different sizes requires motors of different horse power capacities.

The three hundred devices listed are capable of being individually driven; group drive is not considered in this article. It would serve no purpose to mention all the devices that could be operated on group drive by motors of from 1½ to 5 horse power for all sorts of combinations of devices mentioned in previous tables could be made, each group being operated by a motor of from 1½ to 5 horse power. For instance, one person might find it advisable to operate an egg beater, a cake mixer, a dough mixer, and a flour sifter all from the one motor, while another would only operate the dough mixer and flour sifter from one motor, operating the cake mixer and egg beater by a smaller motor.

Three hundred devices capable of being operated by motors of from 1½ to 5 horse power is a fairly representative list. Many of the devices are illustrated, the captions under each cut giving information as to the horse power, voltage, and speed of the motor shown, and where possible, the name of the maker of the machine operated, and its size or capacity.



3 h.p., fully enclosed, special type, Century single phase motor, made by Century Electric Co., 19th, Pine, and Olive streets, St. Louis, Mo., mounted on a surface grinder.

300 Uses for Motors of From 1½ to 5 Horse Power

The following devices are capable of being individually driven by motors of from 1½ to 5 horse power, usually on 110 and 220 volts:

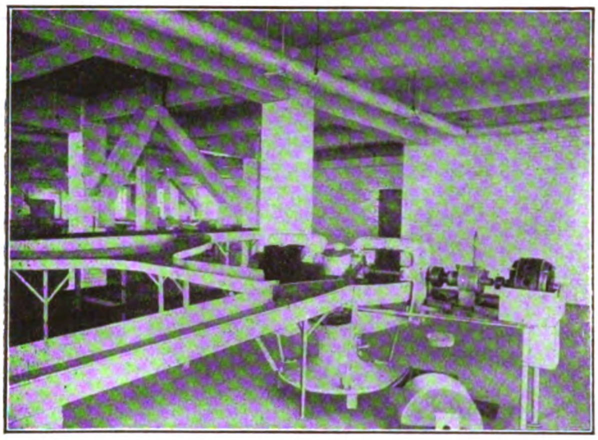
Agitators, liquid
Air compressors (medium)
Arm sanders (woodworking)
Assemblers (bookbinders)
Axle lathes
Baling presses
Band saws
Barrel planers
Barrel washers
Beer pasteurizers
Beer pumps (brewery)
Beer wells
Bevelers
Black leaders (electrotypers)
Blanking presses
Blending mills
Blind slot planers
Blowers (medium)
Bolt cutters
Bolt forging machines
Bolt threaders
Book covering machines
Book cutters
Book saws
Book sewing machines
Book smashers
Book stamps
Book trimmers
Boiler rolls
Boring mills
Bottle soakers
Bottle washers
Bran bag hoists
Bread molders
Bread sealers
Brick setting machines
Brine pumps
Bronzing presses
Broom corn trimmers
Bulldozers (small)
Bung boring machines
Cabinet saws
Cake mixers
Can straightening machines
Candy mixers
Candy polishers
Candy pulley machines
Caramel cutters
Caramel sizers
Carbonators
Carbonic gas compressors
Card cutters
Carding machines (textile)
Carousels
Carpet cleaners
Carpet cleaning wheels
Carton machines
Cash carrier systems
Casein grinders
Cereal cookers
Chocolate melangers
Chocolate rolling machines
Circular shears
Cocoa bean roasters
Cocoa pulverizers
Coffee roasters
Coke loaders
Cold metal saws
Collar rolls
Column sanders
Combination saws
Compressors
Concrete mixers
Corrugating machines
Cracker bakers (revolv.)

(Continued on opposite page)

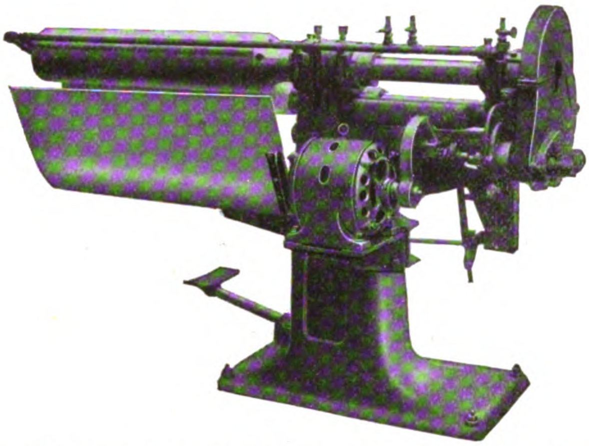
(Continued from opposite page)

Cracker conveyors
Crane hoists
Crane hoist travelers
Crank shapers
Crate saws
Cream beaters (candy)
Cream depositors (candy)
Cream grinders (candy)
Cream separators (dairy)
Cream shirrers (candy)
Cutoff slide presses.
Dado machines (woodworking)
Deep well pumps
Dishwashers (hotel)
Double crank presses
Dough dividers
Dough mixers
Dovetailers
Doweling machines (woodworking)
Drill presses
Dry pans
Drying ovens
Edgers
Elevators (small)
Embossing presses
Emery wheels
Engine lathes
Etching machines (engrav.)
Escalators
Excelsior machines
Exhaust fans
Extractors, laundry
Facing machines (paper)
Feed mills
Flat iron punches
Flat shavers (electrotypers)
Flour sifters
Flue rattlers
Flue welders
Folding machines
Forge blowers
Freight elevators (small)
Fruit droppers (candy)
Gang presses
Gate valves
Gathering machines (bookbinders)
Gear cutters
Glove cutting dies
Glove cutting machines
Glue jointing machines
Glue pumps
Grain elevators (small)
Grain elevator legs
Grain scouring machines
Grain separators
Grinders
Grooving machines (woodworking)
Hammers
Heel shavers, shoe
Heeling machines, shoe
[illegible] (tanneries)
Hoop flaring machines
Hooping machines
Hop separators
Hydraulic presses
Ice crushers
Ice machines
Ink mills
Iron rolls
Iron roofing presses
Jointers (woodworking)
Keg washing machines
Key seating machines
Knife grinders
Knitting machines
Lace looms
Ladle carriers
Lard coolers
Lard presses
Lathes
Lears
Leather knives
Leg squarers (woodworking)
Lime reels (tanneries)
Lining cutters
Linotypes
Loaf molders (bakers)
Looms (textile)
Lozenge dough breakers
Lozenge mixers
Lumber drags
Mangles
Marble drill presses
Marshmallow beaters
Mash mixers (breweries)
Matrix rollers
Meat grinders
Merry-go-rounds
Metal painting machines
Metal shavers
Milling machines
Mincemeat machines
Mine fans
Mining locomotives
Mitre saws
Mixing kettles
Molders
Molding presses
Monotype machines
Mortisers
Mustard cleaners
Notching presses
Oven conveyors
Oven reels
Paddle vats (tanneries)
Panel carvers (woodworking)
Panel raisers (woodworking)
Paper basters
Paper box machines
Paper cutters
Paper washers
Paste machines
Pasteurizers
Peanut hullers
Peanut roasters
Pie rim punchers
Pipe cutters
Pipe threaders
Pitching machines
Plate reducers
Plating generators
Pneumatic tube exhausters
Polishing lathes
Power tables
Printing presses
Pulley borers
Pumps
Punch presses
Racking pumps
Routers (engravers)
Radial drills
Ream cutters
Refrigerating machines
Rice cookers
Rip saws
Rivet machines
Roll cutters (bakers)
Rope hankers
Rounders and backers
Rounding-up machines
Ruling machines
Sack fillers
Sand blast blowers
Sand rolls
Sanders
Sash stickers
Sausage grinders
Saw filers
Scrap balers
Screw machines
Setting-out machines, brick
Sewing machines (factory)
Shapers
Shavings exhausters
Shears
Shoe repair outfits
Shoe sewing machines
Signature presses
Single jointers
Slate saws
Sleeve ironers (laundry)
Slotters
Soap grinders
Soap melters
Soap pumps
Soda mixers
Sole cutters, shoe
Sole layers, shoe
Sole trimmers, shoe
Spice mills
Spindle drills
Sprue cutters
Stamp cancellers
Starch cleaners
Stave benders
Stave dressers
Stave planers
Steel punches
Stitchers, book
Stove planers
Stuffers, sausage
Sugar bolters
Sugar grinders
Sugar mixers
Surface grinders
Surfacers
Swing cutoff saws
Tail cutters, paper
Tallow mixers
Tapering machines
Tenoners
Tie presses
Tile grinders
Tire benders
Toggle drawing presses
Tongue-and-groove machines
Transfer tables (small)
Traveling cranes
Trimmers
Trip hammers
Triplex pumps
Tubers
Tumbling barrels
Turret lathes
Upsetting machines
Vacuum cleaners, stationary
Washing machines, laundry
Weaving machines
Wet tool grinders
Wheel presses
Window frame machines
Wire crimpers
Wood lathes
Woodworkers
Yeast tubs

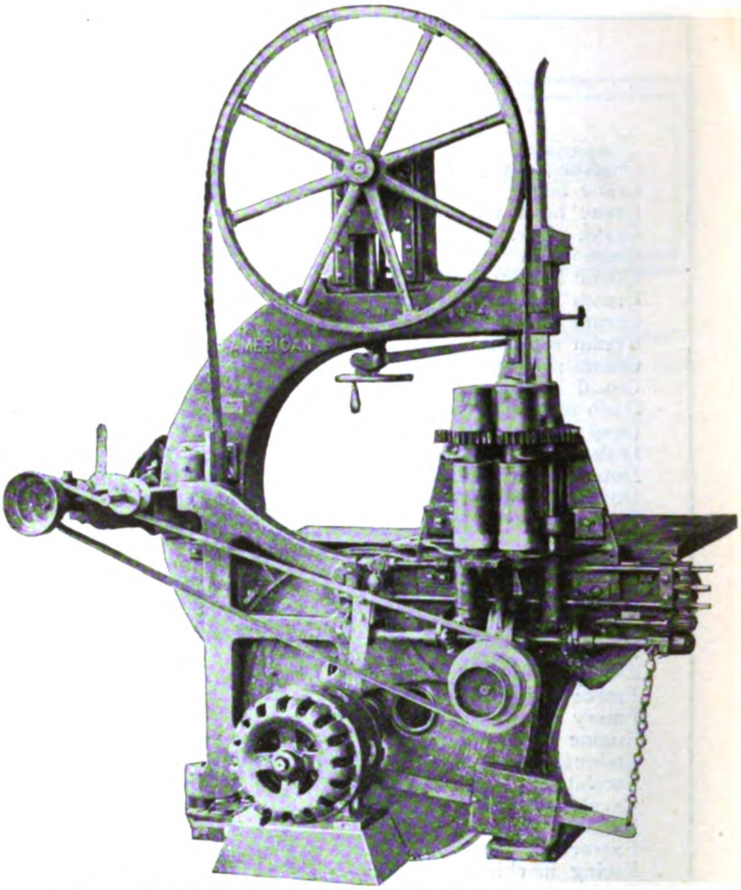
The illustrations accompanying this table show how motors are used for operating a number of these devices, and the captions give motor operating data—voltage, horse power, and speed of direct current machines; voltage, speed, phase, frequency, and horse power of alternating current machines.



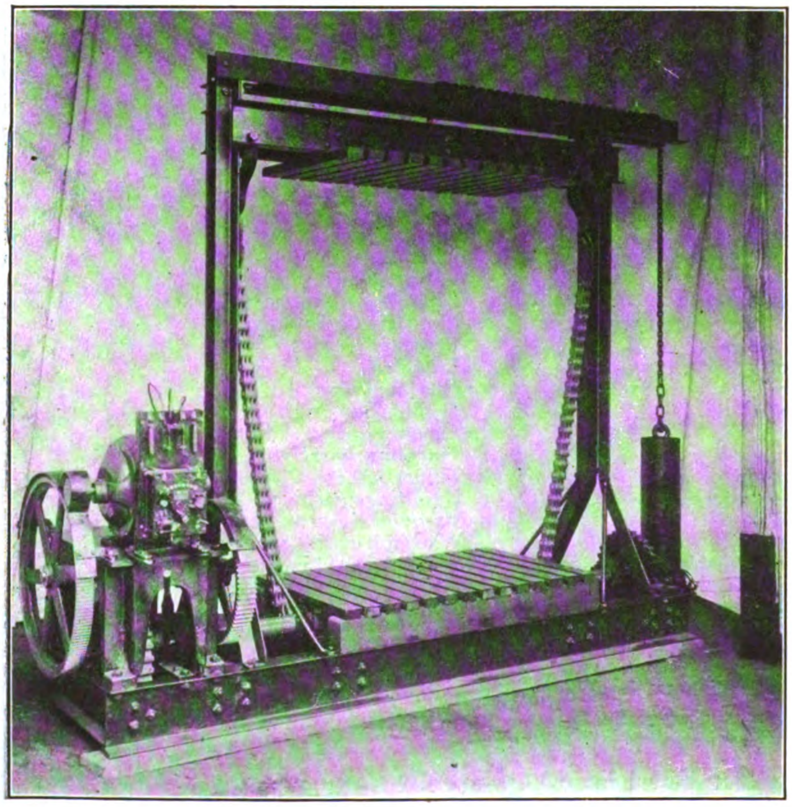
One of five 2 h.p., 1700 r.p.m., induction motors, made by Allis-Chalmers Mfg. Co., Milwaukee, Wis., direct coupled to meat choppers in plant of Libby, McNeill & Libby, Chicago.



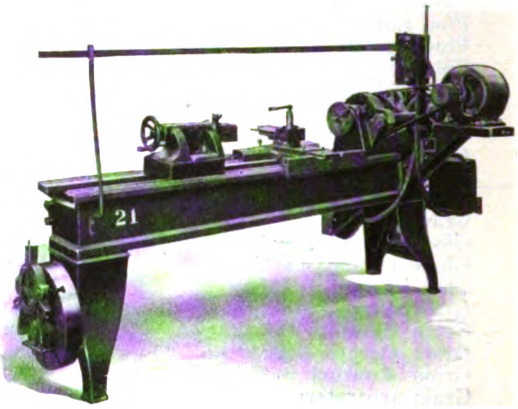
2 h.p., 1750 r.p.m., Century single phase motor, made by Century Electric Co., 19th, Pine, and Olive streets, St. Louis, Mo., geared to an ironing machine.



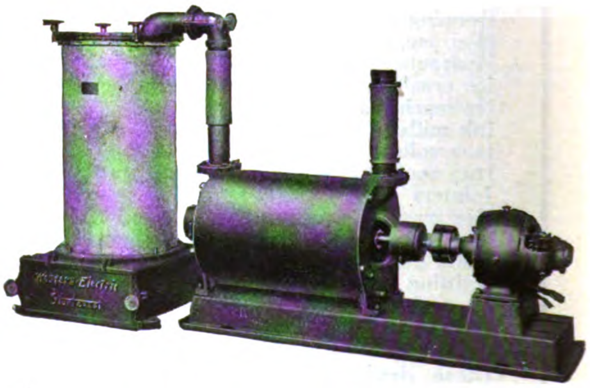
5 h.p., two-phase motor, made by Phœnix Electric Co., Mansfield, Ohio, direct coupled to a band resaw.



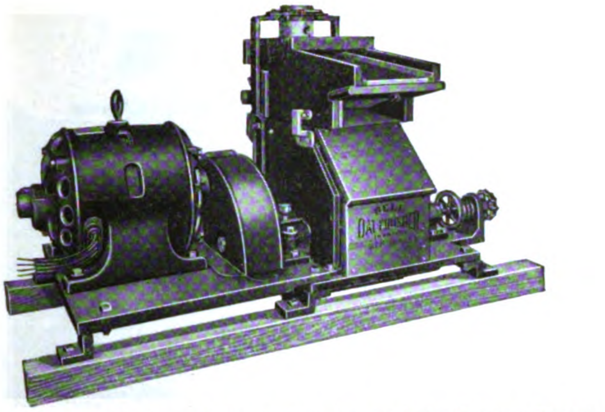
5 h.p., 1,400 r.p.m., 220 volt, dustproof, direct current motor, made by The Fidelity Electric Co., Lancaster, Pa., geared to a Minnich baling press **for all classes of materials.**



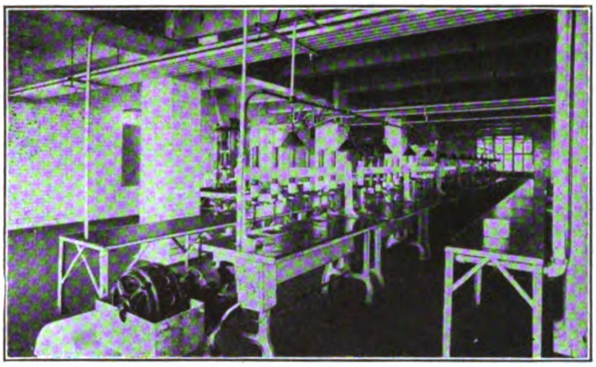
1½ h.p., adjustable speed motor, normal speed 350 r.p.m., with 3 to 1 speed reduction, made by The Mechanical Appliance Co., Milwaukee, Wis., operating a 14-inch engine lathe.



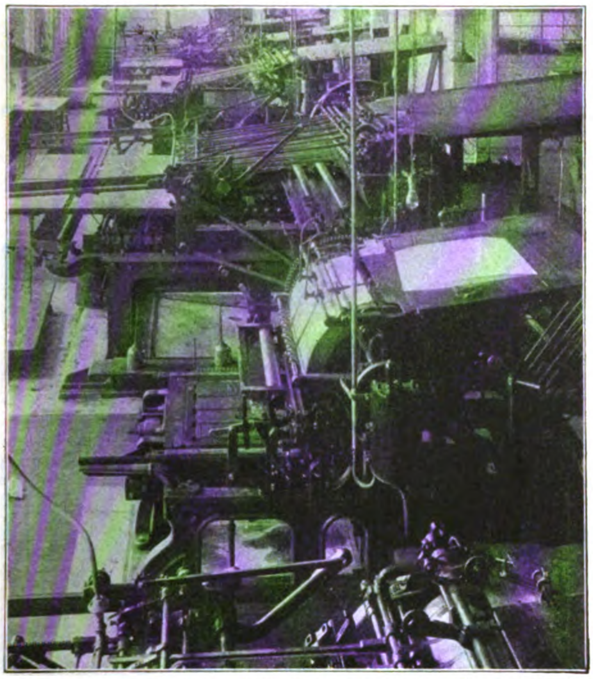
5 h.p., 3,600 r.p.m., motor (110-220-550 volts, a.c. or d.c.), made by Western Electric Co., 463 West street, New York, direct connected to a Sturtevant stationary vacuum cleaner.



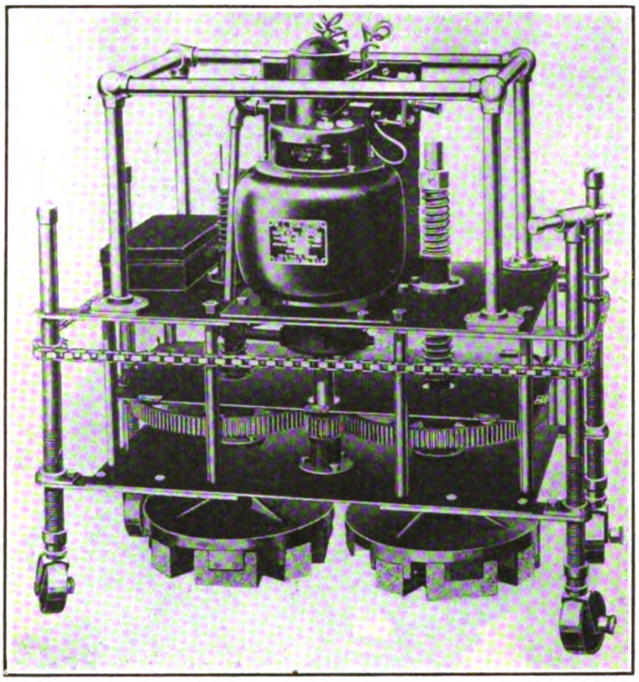
2 h.p., 1750 r.p.m., Century single phase motor, made by Century Electric Co., 19th, Pine, and Olive streets, St. Louis, Mo., geared to an oat crusher.



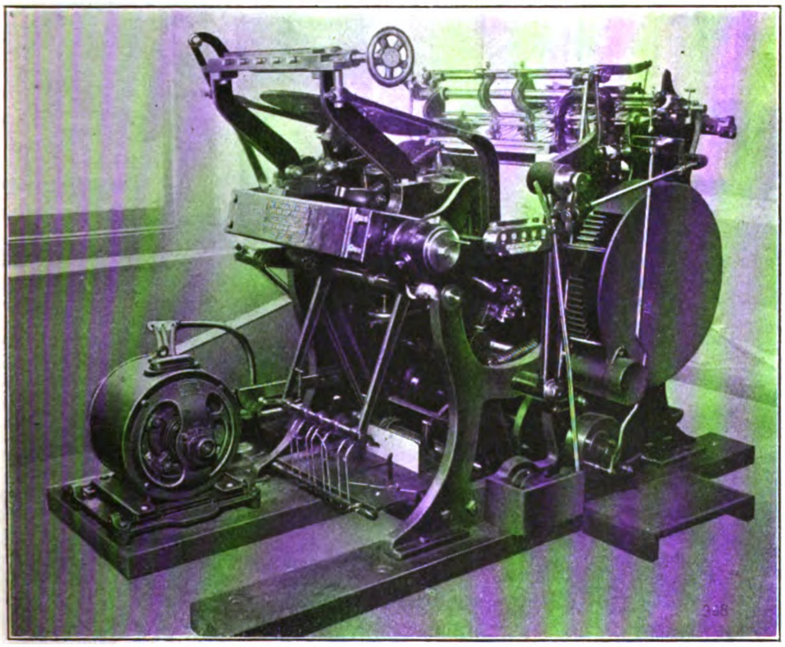
One of four motors (1700 r.p.m.) made by Allis-Chalmers Mfg. Co., Milwaukee, Wis., direct connected to capping benches, in plant of Libby, McNeill & Libby, Chicago.



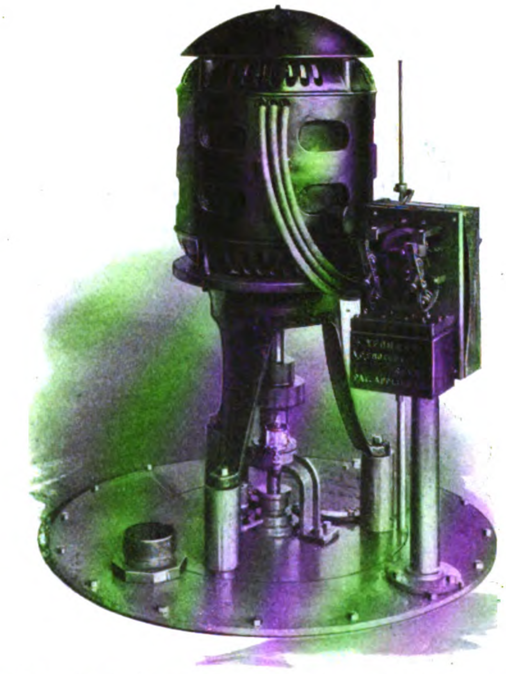
Six-cylinder presses in plant of A. B. Morse & Co., St. Joseph, Mich., operated by from 1½ to 5 h.p. motors made by Kimble Electric Co., 634-646 North Western avenue, Chicago.



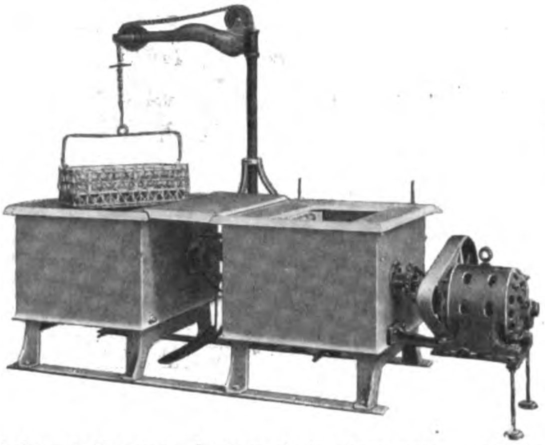
1½ h.p., 220 volt, 1300 r.p.m., direct current motor, made by Crocker-Wheeler Co., Ampere, N. J., direct connected to a stone floor surfacer, made by M. L. Schlueter, Chicago.



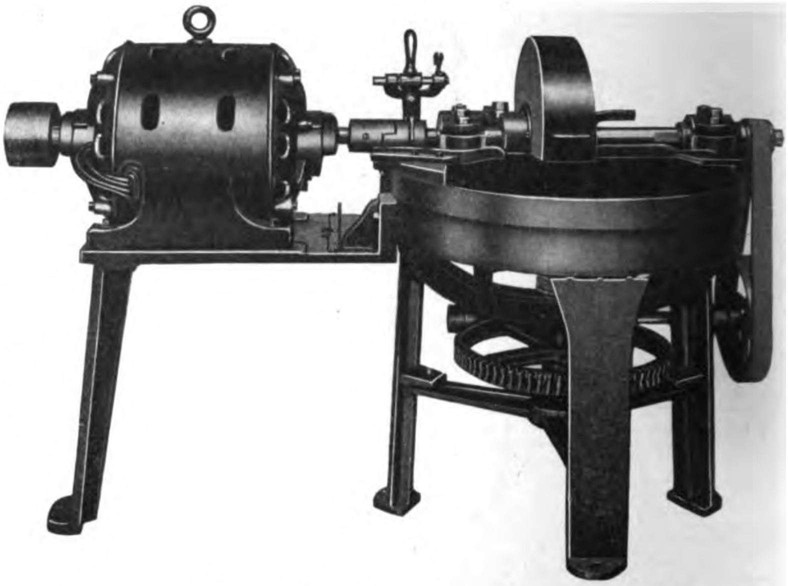
1½ h.p., 220 volt motor, made by Diehl Mfg. Co., Elizabeth, N. J., Belted to an automatic printing press.



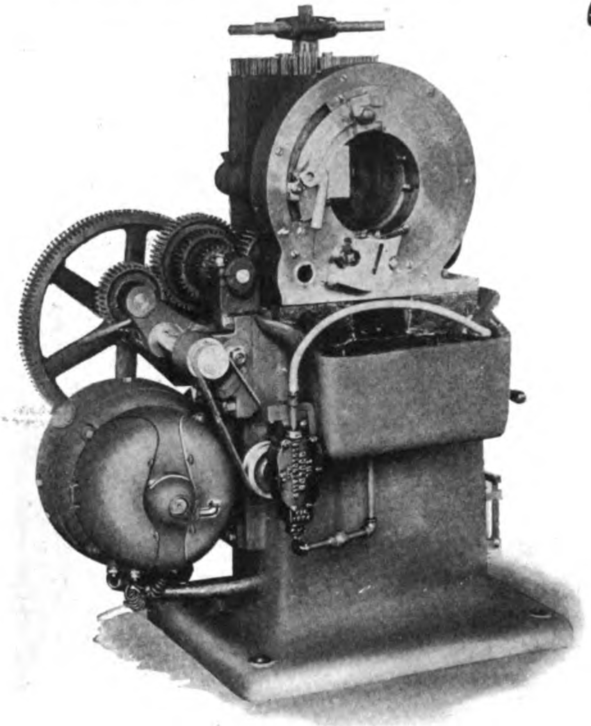
3 h.p., 690 r.p.m., 3 phase motor, made by The Mechanical Appliance Co., Milwaukee, Wis., direct connected to centrifugal bilge pump.



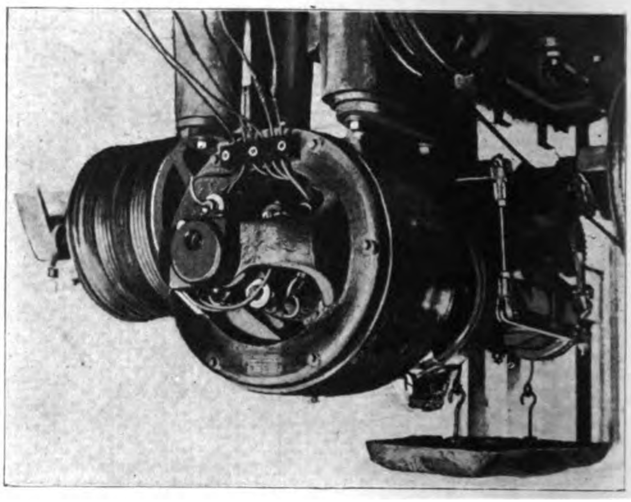
3 h.p., 1165 r.p.m., Century single phase motor, made by Century Electric Co., 19th, Pine, and Olive streets, St. Louis Mo., operating hotel dishwasher.



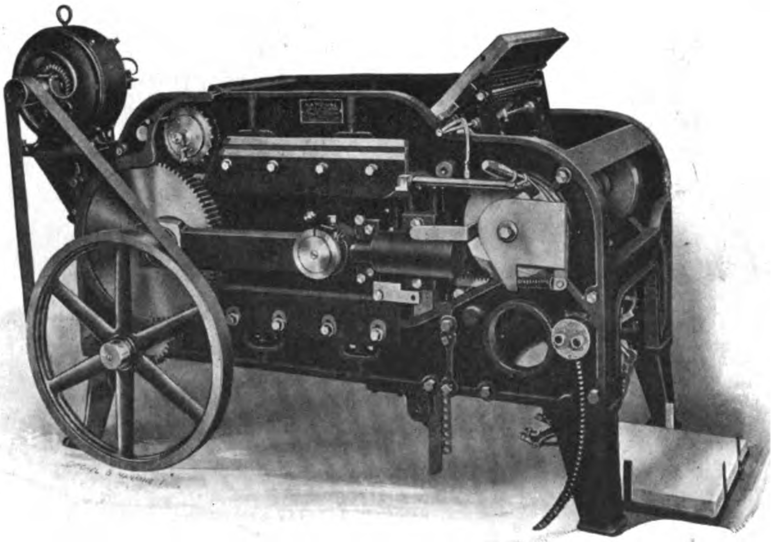
5 h.p., 1750 r.p.m., Century single phase motor with shaft extended on both ends, made by Century Electric Co., 19th, Pine, and Olive streets, St. Louis, Mo., direct connected to a large meat chopper.



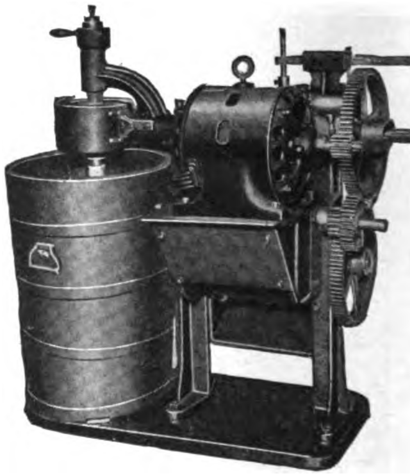
3 h.p., 1,200 r.p.m., constant speed motor, made by The Mechanical Appliance Co., Milwaukee, Wis., geared to a pipe cutting and threading machine.



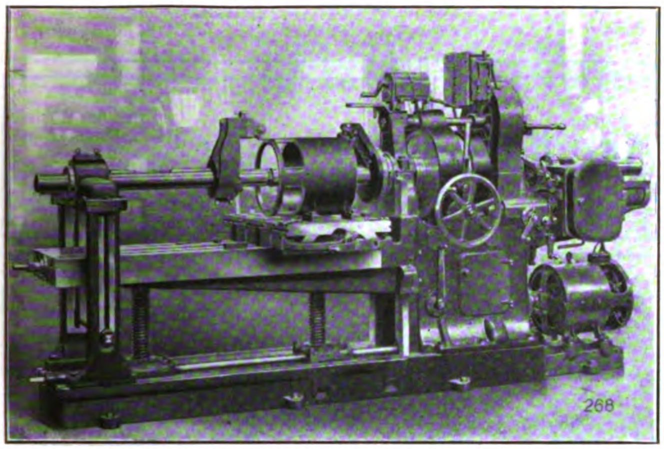
5 h.p., 220 volt, 400 r.p.m., direct current, compound reversible, direct connected elevator motor. Made by The Fidelity Electric Co., Lancaster, Pa.



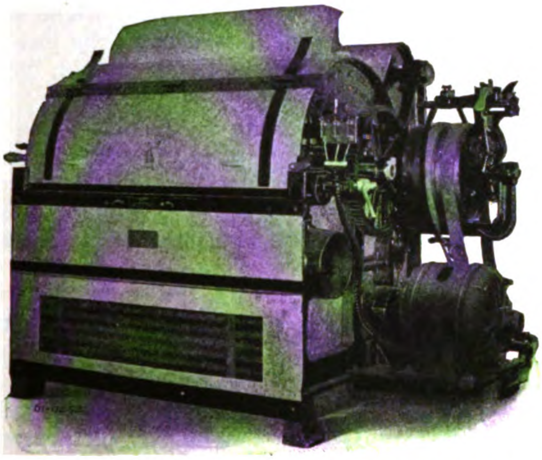
2 h.p., 1,900 r.p.m., 110 volt, d.c. motor, made by The Robbins and Myers Co., Springfield, Ohio, belted to a National automatic printing press for 12 by 18 sheets; does platen press work, ruling, numbering, perforating, scoring, slitting and interleaving.



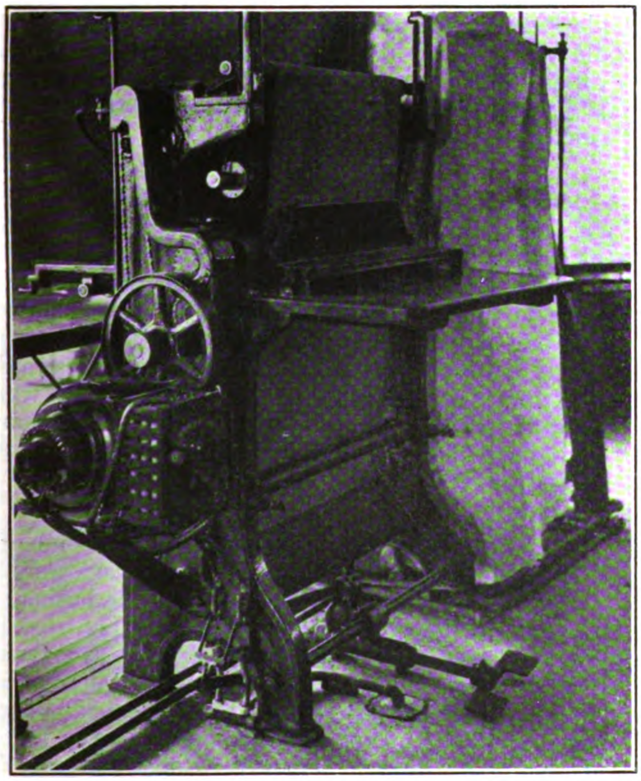
2 h.p., 1750 r.p.m., Century single phase motor, made by Century Electric Co., 19th, Pine, and Olive streets, St. Louis, Mo., geared to a combination, 10 gal. ice cream freezer and ice crusher.



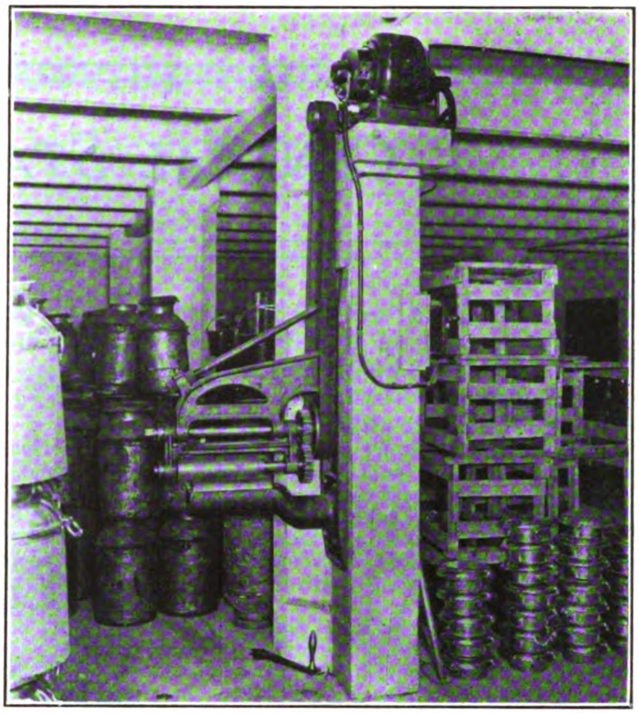
5 h.p., 220 volt, 400-1,600 r.p.m., adjustable speed motor (by field control), made by Diehl Mfg. Co., Elizabeth, N. J., operating a Gisholt boring mill.



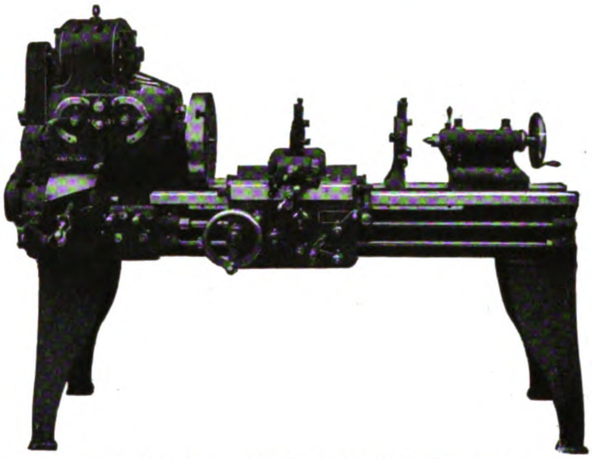
2 h.p., three phase motor, made by Wagner Electric Mfg. Co., 6400 Plymouth avenue, St. Louis, Mo., driving laundry machine.



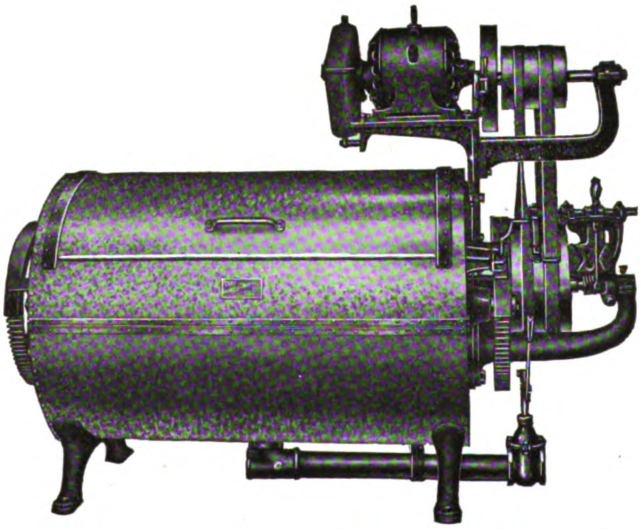
3 h.p., 230 volt, 525 r.p.m. motor, made by Crocker-Wheeler Co., Ampere, N. J., operating a shirt dampener; equipped with regulator without auto release.



2½ h.p., 230 volt, 875 r.p.m., shunt wound, d.c. motor, made by Crocker-Wheeler Co., Ampere, N. J., belted from geared countershaft to a can straightener.



2 h.p., 1165 r.p.m., constant speed, Century single phase motor, made by Century Electric Co., 19th, Pine, and Olive streets, St. Louis, Mo., mounted on a 14-inch metal lathe; speed changes secured by gears in head stock.



2 h.p., 1750 r.p.m., Century single phase motor, made by Century Electric Co., 19th, Pine, and Olive streets, St., Louis, Mo., geared to laundry washing machine.

CENTRAL STATION MISCELLANY

The Portland Railway, Light and Power Co., of Portland, Oregon, is publishing a small four-page weekly which it distributes among the patrons of its local and interurban lines. In the company's own words, this is the object of this effort:

> We are trying to get away from the usual dry, serious and technical form of publication, and to give the public something that will appeal to its sense of humor. In other words, our chief aim is to endeavor to create a better feeling toward us among our patrons and the public in general, by commenting in a good-natured spirit upon the numerous problems involving "service" in all its phases. Included in the publication each week will be one page or paragraph entirely informative or educational in character dealing with investments, interest, taxes, operation, and in a general way with what the company has done and is doing in the way of maintaining reliable service. At all times we expect to be cheerful, optimistic and good-natured, and we plan to discuss frankly some of those problems which through misunderstanding have in our community as well as elsewhere aroused criticism and prejudice and to discuss them from the public utility standpoint.

The Minneapolis General Electric Company will begin at once the installation of an additional 15,000 kilowatt turbo-generator in its Riverside station. The new generator will be ready for operation in time to care for the peak loads of the coming winter. During the week ended March 27, the company secured contracts for 207 electric customers, with 143 kilowatts lighting load and 99 horse-power in motors and took orders for wiring thirty-five already built houses.

The statement of the New York Edison Co. for the year ended December 31, 1914, as filed with the Public Service Commission of the First District of New York, shows:

Operating revenue		$23,538,342
Operating expenses	$9,932,976	
Taxes	1,361,624	
Uncollectable bills	101,767	
Total deduction		11,396,367
Operating income		$12,141,975
Non-operating income		1,370,105
Gross income applicable to corporate and leased properties		$13,512,080
Interest, rents, etc		3,788,144
Net corporate income		$9,723,936
Other credits from surplus		1,115
Previous surplus		29,614,703
Total		$39,339,754
Deductions:		
Renewal and contingency reserve		3,483,055
Dividends		3,720,204
Miscellaneous debits		45,151
Surplus at close of year		$32,091,344

Among the utilities not affected by the jitney is the Pacific Gas and Electric Company of California, one of the five largest organizations of its kind in the United States. That it has escaped jitney competition is due to the fact that its traction business accounts for only a small percentage of its total earnings. Its main business consists in supplying its 378,000 customers with electricity, gas or water. Earnings for the March 31, 1915, quarter showed gross of $4,749,327, a gain of $406,751 over the same period of 1914, and the balance for the preferred was running at an annual rate $1,000,000 better than last year. The company has the contract to supply all the gas, steam and electricity used in the Panama-Pacific Exposition and this business is expected to bring in about $500,000 additional revenue this year. It also furnishes the power for the Municipal Railways of San Francisco, which constitute the chief means of transportation from the city to the fair grounds.

The Union Company of Omaha, Willis Todd, manager, has bought the Osceola, Iowa, Light Heat and Power Co. In addition to rebuilding the gas plant of the company, some 40 miles of transmission line will be built.

The Southern Power Company has let a contract for the construction of a 30,000 h.p. hydro-electric generating station on the Catawba River. The power will be generated under a 50-foot head. The new station will contain five generating units and upon its completion, about September, 1916, the company will have 100,000 h.p. generating capacity within a few miles on the Catawba River.

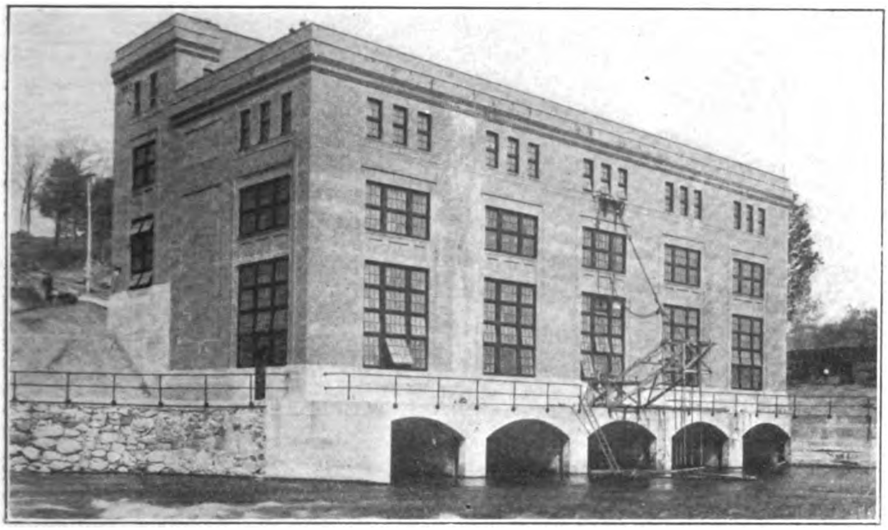
The New York Edison Co. is carrying an advertisement in the daily papers showing by pictures the relative size of the number of candle-power hours obtained for 1 cent between 1884 and May 1, 1915, when the price of current was reduced to 8 cents per kilowatt-hour. In 1884 a customer was supplied with 9.1 candle-power hours for 1 cent. In 1894 he got 15.1 candle-power hours for the same amount; in 1904, 20.08 candle-power hours; 1914, 166 candle-power hours, and on May 1, 1915, 195.03 candle-power hours for 1 cent.

The 15th annual report of the Philadelphia Electric Co., submitted at the annual meeting held at Camden, N. J., April 14, 1915, shows grows earnings for 1914 of over eight million dollars. The net income was close to two million dollars. Dividends amounting to one and a half million dollars were paid during the year. During the year the increase in the number of consumers was 7,706. The connected load was increased by 382,248 fifty-watt lamps. This company has about thirty generating stations and substations in and about Philadelphia.

Application has been made by the receivers of the United States Light & Heating Co., of Niagara Falls, to wind up the receivership and transfer the business and property to the reorganized company. The stockholders have given consent to this movement. It is expected that the receivership will be discontinued some time in June, meantime business will be conducted under the same operating management as before. The receivers of this company are James A. Roberts, New York: James A. Moore, Buffalo, and J. Allan Smith, Niagara Falls.

Falls Village Development

The Falls Village Development of the Connecticut Power Company is located on the Housatonic River at Falls Village, Conn. The development is on the site of a water power project dating from 1851, a portion of a three level canal, built at that time, being utilized for the new plant which was constructed by the Stone & Webster Engineering Corporation.



Power station at Falls Village, Connecticut.

A pondage of 21,000,000 cubic feet is available at Falls Village, equivalent to a continuous flow of 243 cubic feet per second for 24 hours. A second pond, impounding about an equal body of water, is located at Canaan, farther up the river. The drawdown of the Falls Village pond is 8 feet, and that of the Canaan pond, 2 feet.

At Great Falls, about a mile above Falls Village and at Little Falls, a short distance farther up stream, the Housatonic drops about 60 feet and 12 feet, respectively. Together with the drop in the river between these points and the power station, a net head of 90 feet, or a gross head of 92 feet, is obtained. The maximum flood provided for equals 50 cubic feet per second per square mile of drainage area, of about 32,000 cubic feet per second for the 644 square miles drained.

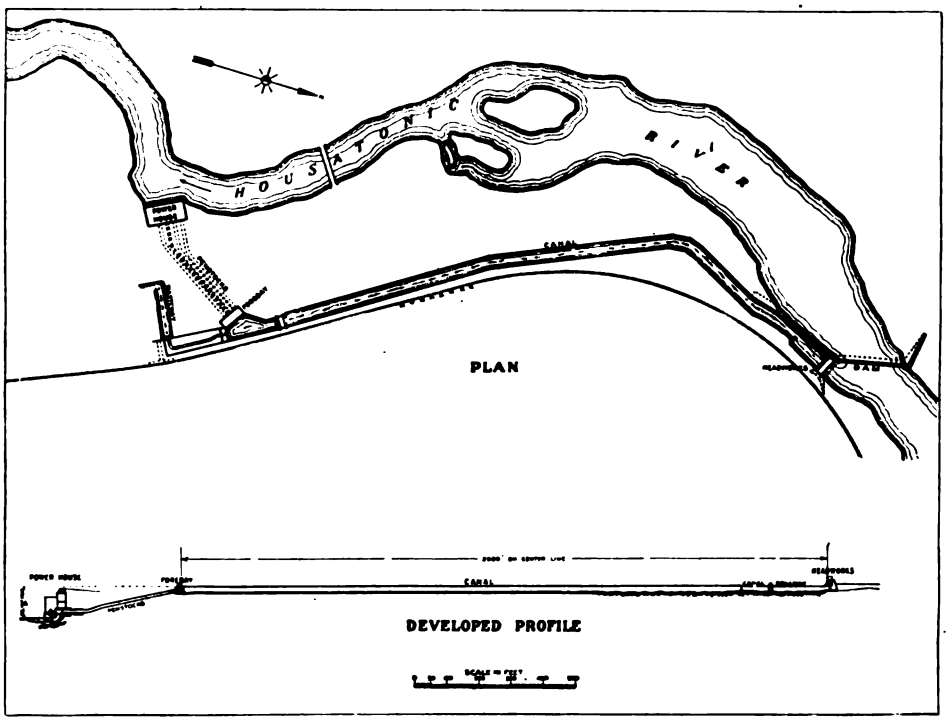
A concrete dam of the gravity type was constructed just above Great Falls. It is 320 feet long, has a normal base width of 22 feet, is 15 feet in height above the river bed and has a maximum height, including foundations, of about 20 feet. Flood elevation is estimated at 9 feet over the crest.

A skimming gate, for the removal of drift, 10 feet wide and 8 feet deep, is located in the headblock. Leading from the pond into the canal are four main headgates with submerged orifices 10 feet wide and 5 feet deep. The gates are both hand and motor operated.

A hydro-chronograph, made by the Hydro Mfg. Co., Philadelphia, is installed at the power station, with floats in the pool and in the canal, above and below the headblock. These floats operate the recording instruments in the station which shows the levels of water and notifies the engineer as to the need of opening or closing the gates, which are operated by remote control motors of 7.5 h.p. on each gate hoist.

The canal leading from headworks to forebay is of reinforced concrete, 1930 feet long, 12 feet deep under normal conditions, and has an average width of 40 feet. Immediately below the headblock, and dividing the canal from the river, is a spillway 260 feet long provided with 18-inch flashboards. At the centre of the spillway is a canal sluiceway with an 8 by 8 foot gate and double-stem, hand operated hoist of Dilts Machine Works manufacture.

The crest of the canal spillway is 9 feet below the crest of the main dam. Throughout its length the canal is underdrained, and contraction joints are provided every 75 feet. The capacity of the canal is 1,600 cubic feet per second at a 4-foot velocity for the present development of 9,000 kw., with an ultimate capacity of 2,500 second-feet.



Falls Village development. Connecticut Power Co.

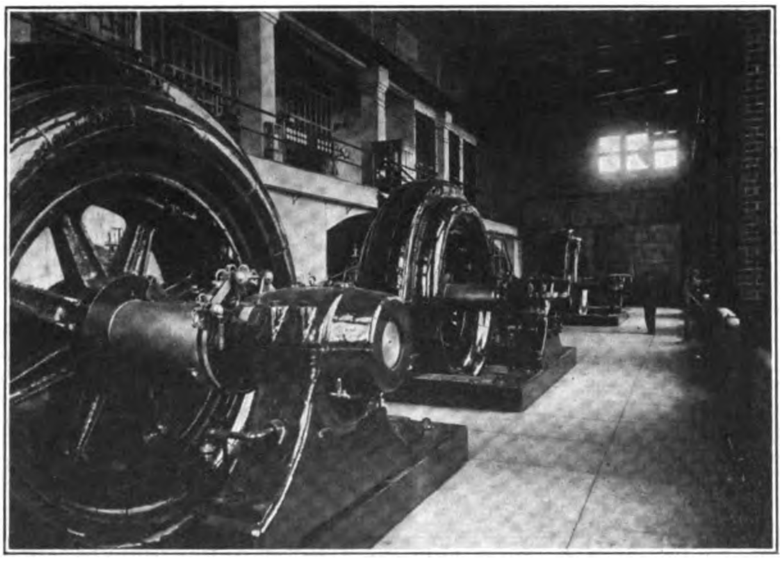
At the lower end of the canal is the forebay, with an overflow leading by natural drainage back to the river. This overflow is 20 feet wide and is designed for 1-foot flashboards. The crest of the forebay spillway is built 1 foot higher than the crest of the canal spillway, in order to insure the overflow coming at the upper end of the canal except in cases of sudden surges from the penstocks, when the forebay overflow would give relief.

The penstock headgates consist of four main gates—one of them being held in reserve for the installation of a fourth generating unit. Each penstock headgate is 9 feet in diameter. There are two exciter gates for penstocks, 3 feet in diameter. The larger hoists are of the double-stem type, of Dilts Machine Works manufacture, and are individually motored with 7.5 h.p. Richmond motors. The two exciter penstock gates are hand operated.

The main penstocks are respectively 360, 370, and 390 feet long, and the exciter penstocks, lying between the larger pipes, are 383 and 387 feet long. The main penstocks are of sheet steel, lap riveted, 5/16, 3/8 to 7/16 inch thick, and the penstocks for the exciter units are of 1/4 inch steel. The penstocks rest on concrete cradles. They are anchored by concrete collars, and are buried in earth for their entire length.

The maximum head on the penstocks is approximately 78 feet. Each is provided with an air vent 20 inches in diameter for the main penstocks and 6 inches for the exciters, these vents rising to 15 and 18 feet above the center lines, respectively. The wheel cases are cast in the concrete foundations of the station, the generatorrs being located just inside the upstream wall of the building.

The station has concrete foundations resting on hardpan and rock, the substructure being of concrete with steel frame, brick walls, and concrete floors and roof. Ground dimensions are 120 feet 10 inches by 61 feet 8 inches. The structural steel was furnished by the Lewis F. Shoemaker Co., Pittsburgh, Pa.

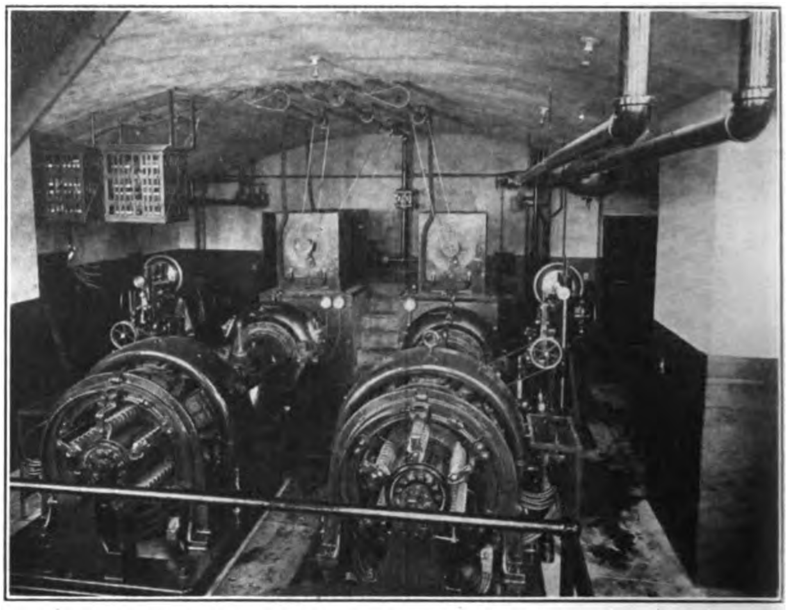


Main generator room. Falls Village power station.

A 25-ton, 3-motor, Whiting traveling crane, with 35 foot span, operates over the main generator floor.

Three generating units are now installed, with space in reserve for a fourth. The turbines are of Wellman-Seaver-Morgan manufacture, each rated 5,000 h.p. and operating at 300 r. p. m. on a 90-foot head. The wheels are of the horizontal, double runner type, with cast steel runners, 44 inches in diameter. The two exciter wheels are of 250 h.p. rating, of like make and type.

The main unit draft tubes are built in the concrete foundations with a quarter turn. They are circular in shape, with a diameter of 8 feet 8 inches, enlarging to a rectangular section, 16 feet 6 inches wide and 10 feet high at point of discharge, and with circular ends of 4 feet 4 inches radius. The length along center lines is 27 feet.



Exciter bay, Falls Village power house.

The exciter tubes are of ¼ inch steel plate, 20 inches in diameter, enlarging to 4 feet diameter and have a center length of 17 feet, bending 5 feet 8 inches in horizontal direction in 16 feet 2 inches, vertical distance.

The governors are of special Lombard design, those for the main generators being horizontal, and for the exciter units, vertical.

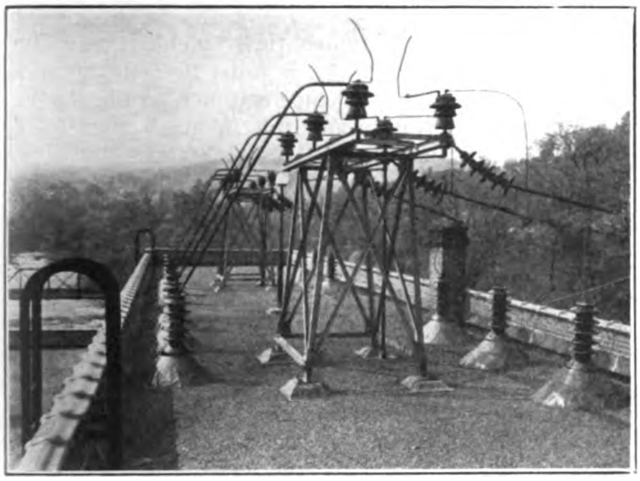
The generators comprise three direct-connected 3,000-kw., 3,750-kva., 6,600-volt, 3-phase, 60-cycle, Allis-Chalmers alternators having a guaranteed efficiency on full load of 95.0 per cent. with 100 per cent. power factor.

The exciters, which are located in an arched concrete bay under the switchboard floor, consist of two 150-kw., direct-current, 125-volt, 1,200-ampere, Allis-Chalmers generators operating at 600 r. p. m. In the same bay are installed the rheostats for the generators, and the oil system and tanks including two storage tanks, one for the filtered and one for the unfiltered oil, with a filtering system. Oil circulation is supplied to the transformers, oil switches and lightning arresters by means of a motor driven pump. An oil system for the governors is located in a pit under a staircase leading from the generator floor to the switchboard gallery.

Six Allis-Chalmers step-up transformers, each rated 2,500 kw., are located in two banks of three units, one bank at either end of the switchboard gallery floor.

The transformers are oil-insulated, water-cooled, rated 6,600/66,000 volts, single-phase, 60-cycle, connected 3-phase in delta, ungrounded. Each transformer is mounted on a track which enables its being drawn from its compartment to the projecting gallery floor, in range of operation of the Whiting crane. The compartment floor is provided with channels to drain the oil into the river, and with double iron doors which enclose each compartment and render it fireproof. For local service, a bank of three 25-kw., step-down Westinghouse transformers is installed, rated 6,600/220-110 volts.

The switchboard and wiring was furnished by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. The board is of black Monson slate, 20 feet long, 7½ feet high and consists of 11 panels and bracket. Panel 1 is for station service, 6,600-volt line and bus tie switches; panel 2 for high tension transmission and line No. 2; panel 3 for line 1; panel 4 is reserved for generator No. 4; panel 5 is for generator 3. Nos. 6 and 7 are for generators 2 and 1, respectively. There are two exciter panels, a Tirrill regulator panel, and a panel for the storage battery.



Roof towers and horn gaps. Falls Village power house.

Over the switchboard room is the high tension room, which forms the upper story of the building. Here are located Westinghouse electrolytic lightning arresters, Type A, and the high tension oil switches. Across the center of the room is a bus tie switch which divides the 66,000-volt bus into two parts, each independent of the other. The arresters are grounded to the penstocks. Between the incoming and outgoing lines and the high tension switches are G. E. disconnecting switches. The oil switches are Westinghouse, type G. A., rated 70,000 volts.

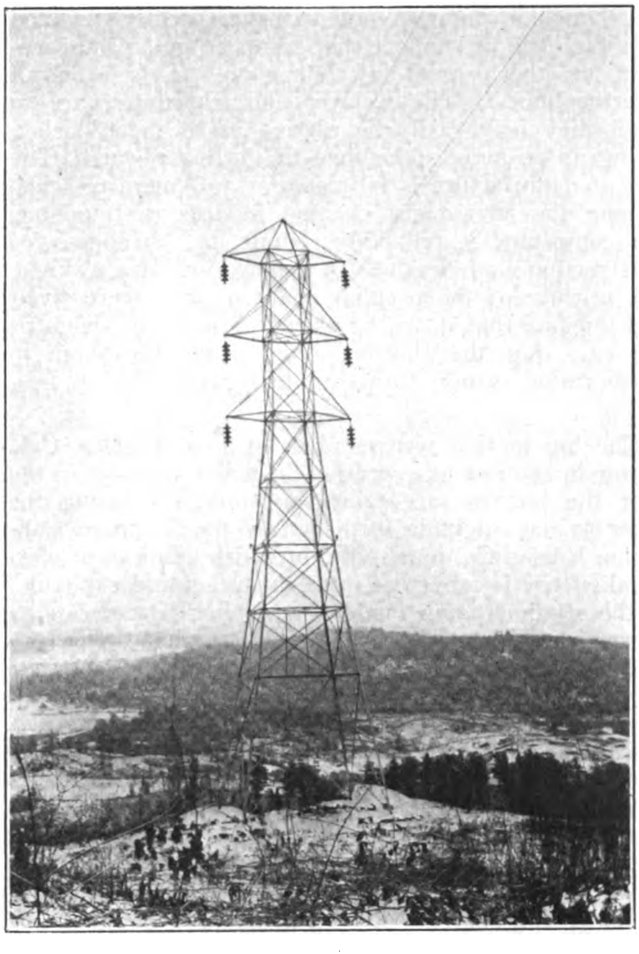
On the roof above the high tension room are installed the incoming and outgoing lines. The lines enter the room below through Thomas roof bushings, and pass through the disconnecting switches noted, to the breakers, ranged crosswise of the room.

The transmission line is 38 miles in length, current being transmitted at 66,000 volts to Torrington, Thomaston, and Bristol. The line consists of a double circuit of 6 No. 2 B. & S. copper conductors. The system is constructed for 12,000 kw. at 66,000 volts, and is designed to operate in relay with other plants. In connection with this plant a small hydroelectric station at Canaan is operated under a 12-foot head and an auxiliary steam plant with 440-h.p. boiler capacity and 250-h.p. engine is tied in with Falls Village and Canaan.

Milliken galvanized steel towers, spaced at 430 feet average, carry the high tension line. The towers are of the square base type, erected on foundations of steel set in concrete, and are uniformly 57 feet in height, the lower cross-arms rising 37 feet above ground. The three cross-arms are spaced 8 feet apart horizontally, the upper arm coming 4 feet below the peak of the tower. The length of each arm is 12 feet. Each cross-arm is designed for a pull of 1,550 lb. in direction of line. In theory, every tenth tower on tangents is anchored, but in practice, owing to the numerous angles in the line, about every fifth tower is anchored. The line is built on a 100-foot right of way, cleared of woods and undergrowth.

Ten-inch suspension disc insulators, of both Locke Insulator Co. and the Pittsburgh High Voltage Insulator Co. makes, are installed, four discs in vertical and five discs in strain positions. The wires are spaced 8 feet vertically and 12 feet between lines, the insulator being attached to tips of cross-arms. The wires clear the ground by more than 26 feet between towers, under maximum loading of ice and snow. There are no transpositions of line. Siemens-Martin 5/16-inch, 7-strand steel cable is used for grounds. A telephone circuit is carried on angles of the towers, 25 feet above ground and 8 feet below main conductors.

Much of the power generated at the Falls Village plant is utilized by manufacturing companies in Bristol and Torrington. Lighting for the towns through which the transmission line runs is also provided. For the latter purpose substations are located in Torrington and Bristol, having a present equipment of two banks of three 1,000-kva., 66,000/2,300-volt transformers. In the Thomaston substation there is one bank of three 500-kw., step-down transformers of the same rating.



Transmission line, 66,000 volts. Connecting Falls Village power station.

New York City will contract with the New York Edison Co. and subsidiary companies to construct, maintain, and operate a line of towers and poles over the Catskill aqueduct lands for the purpose of supplying electrical current. The contract is for 25 years, and in payment for the franchise the Edison company will give to the city, free of charge, all electric power for working, lighting, and pumping of siphons, along the route of the new aqueduct.

TECHNICAL
SCIENTIFIC

FINDINGS

PHILOSOPHICAL
THEORETICAL

An interesting electrician is found among the catfish, says *The Edison Monthly*. He is known as *Melapterus electricus*, and comes from the River Nile. His entire body, except his head and fins, is enveloped in electric cells. In other words, he has a burglar alarm attached to every nerve of his body. There is also an electric "balloon fish" (*Tetradon*), which lives among the sea rocks near the Comoro Islands. When captured, it gives forth heavy electrical shocks and immediately assumes the shape of a balloon, hence the name.

A Dutch inventor is said to have recently invented a simple little instrument that seems to be an improvement on the present-day telephone. It is called a "thermophone." The receiver and transmitter are so small they may easily be carried in the vest pocket, taking up no more space than the ordinary watch. The cost of manufacture is estimated at 30 American cents. Among the advantages claimed for the thermophone are compactness, reliability, simplicity, cheapness of construction, and clearness of enunciation. It is claimed, too, because of the peculiar character of the receiver, and the fact that it can be placed close to the drum of the ear, that the thermophone is of advantage in ameliorating certain forms of deafness.

The big motion picture plant at Los Angeles, Cal., is now in continuous operation. During 315 days in the year the pictures are taken by sunlight; during the other 50 days light is furnished by the Southern California Edison Co. in a studio in which 480 h.p. of electrical energy is converted into "manufactured sunlight." In this studio are now installed a number of 2000 candlepower mazda lamps equipped with holophane reflectors, also a number of banks of Cooper-Hewitt mercury vapor lamps, each bank consisting of 8 tubes arranged one above the other with mirror reflectors behind each. These banks are mounted on casters so that they may be easily arranged in position. Each bank furnishes 6400 candle-power.

In round numbers the total annual production of coal in the world at the present time is 1,250,000,000 tons, of which the United States contributes between 38 and 39 per cent., and the combined output of the European nations now at war approximates 50 per cent.

It has been noticed how promptly in various branches the pressing demands for indispensable supplies hitherto covered chiefly or entirely by importations from Germany have been met by rapidly organized American effort since the outbreak of the European conflict. Examples are compressed hydrogen, curved watch and clock faces, water-color brushes, and a dozen other articles the manufacture of which is now permanently established on American soil as the result of being brought abruptly face to face with an emergency. If for some months there should be difficulty in securing the more brilliant and intense tints, yielded only by the synthetic coal-tar products, it must be remembered that we are sharing an experience common to the whole world outside of Germany and felt in most cases to a far greater extent than in the United States.

The Bureau of Standards, Washington, D. C., has just issued a leaflet containing the melting point, Fahrenheit scale, of the chemical elements. Among the melting points given are the following:

Phosphorus	111.2	Gold	1945.5
Sulphur	246.6	Copper	1981.5
Tin	449.4	Nickel	2646.
Lead	621.3	Iron	2786.
Zinc	786.9	Platinum	3191.
Aluminum	1217.7	Tungsten	5430.
Silver	1761.	Carbon	6500.

After several years of experimental and development work, the Western Electric Co. has just placed on the market a printing telegraph system that will undoubtedly create a new epoch in the history of telegraphy. By this system, a message, written upon a modified form of typewriter at one end of a telegraph line, is automatically printed, ready for delivery, at the other. Furthermore, not only one, but *eight* messages may be sent simultaneously over a single wire, each message being printed as fast as the sending operator can typewrite it. A trial installation of this system, which has been operating between New York and Boston for the past year and a half, has been working practically day and night, frequently at a total speed of 360 words a minute.

The telephone line from New York to San Francisco is overhead throughout its entire extent except for a few short stretches of cable in cities and under rivers. Notwithstanding the improvements which have been made in underground cables, it is still necessary in such long lines as this to exclude as far as practicable all lengths of cable however short. Even with the very best cable and apparatus known to the art, the distance through which speech may be clearly and distinctly transmitted is greatly restricted when the wires are placed underground.

The two big dangers in deep-sea diving are the compression away down below and the de-compression coming up and out. Divers used to believe it was the water's weight above them that would smash out their lives. On the contrary, the pressure of deep-sea water is as great on the soles of your feet as on top of your head. It had to be learned that the diver must be charged like a siphon bottle as he sank. Every 33 feet down he must get another atmosphere of ozone, a duplicate of that we breathe. At the depth of 66 feet he needs two atmospheres, to keep his lungs and blood fed. If he could descend 330 feet he would require ten atmospheres.

Arc Welding and Its Application in the Metal Working Industry

Welding is the joining of two pieces of metal of like or unlike character by melting them together at the point of contact.

The electric arc is used merely as a method of applying heat at the point where it is desired. It has no other utility. All metals whose edges are applied at a fusing temperature will stick together with a strength which is practically equal to the original piece, and it makes no difference whether these metals are heated by the use of the forge fire, electric arc, oxy-acetylene, or any other method as long as they are applied when they are at a melting temperature and as long as the surfaces which are applied are clean so that intimate contact can take place.

The reason the electric arc is used in preference to the other methods for getting this heat is entirely one of cost. If it were possible to get this same heat applied with equal utility by some other means which would be cheaper than the arc, such a method would be that much better than the arc.

There are other methods of applying this heat. The one which is most used is that of the forge fire in which the pieces welded are heated to a welding temperature and then applied at this welding temperature and pressure or hammering applied to make the contact between the two pieces more intimate. The oxy-acetylene blow torch is also used and is entirely successful with the one exception—that the cost compared to the arc is extremely high. The comparative cost of the oxy-acetylene and the arc for applying the heat is approximately in proportion to the cost of heat per calorie produced by each. Heat produced by the oxy-acetylene torch costs per unit from ten to thirty times as much. This is taking both electric current and gas at the usual prices. It is this one fact and the fact that the amount of heat liberated by the arc can be adjusted within wide ranges, much wider than is possible with the oxy-acetylene, that the arc's superiority is shown. This and this only is the determining factor in their comparison.

The electric arc may be applied to practically all metals which are to be welded. There are several difficulties which must be encountered, notably, expansion and contraction, which are apt to leave internal strains if not compensated for. This is self-evident since the pieces which are welded are heated at one spot only, the rest of the piece being left cool. This difficulty is particularly marked in large pieces where only one spot is heated and where the metal itself is brittle, such as cast iron. It is true also in certain shapes of steel. In order to eliminate this where necessary, preheating or annealing is resorted to. Annealing always is necessary in gray or malleable iron if machining is to be done on the weld when it is completed, since the chill at the point of weld or the points immediately around it will result in a glass-hard surface.

A second difficulty which is encountered in welding is the formation of oxide. All welds are made at a temperature at which the metal will oxidize very rapidly and it is often necessary to float this oxide on the top of the weld in order to get the welded surfaces clean. However, with this scheme a perfect weld can be made in all kinds of metal and have the weld itself entirely clean and free from oxide.

Another difficulty which is often encountered in very thin metal is the arc burning through. This requires backing up of the weld in metals of less than 18 gage, with some heat conductor which will carry the heat away and prevent burning through. Backing these metals up with a piece of cast iron or steel will always eliminate this difficulty.

Another vital point to be considered is the comparative speeds that it is possible to get by the use of various methods of welding.

There are two methods of applying the arc and these methods have a very considerable to do with the speed of operation. The first and most easy method of application is with an arc formed between the piece to be welded and a carbon electrode. In such a weld as this, the amount of heat which can be liberated is unlimited, therefore, the rapidity of melting is also unlimited. In any steel casting or in some boiler plate, this scheme can be used and will result in very high speed of operation, enormously faster than it is possible to get with any other method of working. For thin sheet metal, the method used is that of the metallic electrode arc in which the electrode used is a piece of soft steel which of itself becomes the filler and is melted off of the electrode by the formation of the arc. This scheme has a great advantage in that the heat will not travel but a very short distance away from the weld, and the weld itself, outside of the one spot where it is being welded, remains at a very low temperature, thus eliminating warping of the piece and internal stresses. The speed of this, however, is not nearly as high as it is possible to get by the use of the carbon arc, but is favored on account of the fact that it eliminates warping and makes a softer weld than is possible with the carbon arc. It also eliminates almost entirely, all oxide in the weld. This method of welding is practically the same speed per foot of welding as by the use of the oxy-acetylene, both being in the hands of skilled operators and both working to the best advantage. The lower cost of the current in comparison with the cost of the oxy-acetylene, therefore, makes the arc method the best. Electric arc welding in its application is comparatively new, and like any new process has been hedged about by the manufacturers of arc welding machines with a great deal of mystery which has resulted in a very slow application. This process is becoming increasingly popular, however, and is being rapidly adopted.

Another feature which has contributed to the slow application is the fact that the few manufacturers of welding apparatus have placed ridiculous prices on the welding machines and have cast around them as many supernatural qualities as possible. When it is remembered that the one and only function of the electric arc is the furnishing of heat at the weld, a great deal of this mystery is eliminated. It does not make any difference whether the arc is formed by one machine or another. Electricity is electricity, and an arc is an arc. The results will be exactly the same no matter whose generator makes the "juice."

There have been a number of different machines devised for arc welding. All of them tend to save part of the energy which would be wasted if standard voltage were used in connection with the arc. No welding machine does any more than to make a saving of part of this wasted energy. A piece of fence wire of proper size and length connected to any direct current source will do just as good welding as the best and most efficient welding machine that can be built or ever will be built. The one and only function of the welding machine is the saving of the energy which would be wasted by using resistance in series with any direct current standard voltage.

The voltage across the arc in arc welding will vary from 15 to 50 volts, depending on the length of the arc, the amount of current flowing, and also the electrode used. It is self-evident, therefore, if this current is taken from a 250-volt direct current supply, that from 200 to 230 volts must be dissipated in a resistance in series with this arc. A device to save part of this wasted energy forms part of all arc welding machines.

The arc welding machines which are manufactured are divided roughly into two classes, the one known as a constant voltage machine and the other known as a drooping characteristic machine. The ordinary constant voltage machine is a motor-generator set which will take energy from the supply line at the voltage of the supply line and operate a constant voltage compound wound machine at 75 volts for the welding circuit. It is necessary, of course, to have a resistance in series with this 75-volt machine in order to get the pressure down to the voltage required by the arc. A machine of this kind, however, generally is a good investment, as it will show a considerable saving when continuously used, over the resistance in series with the 250-volt supply line. The saving of this energy is the chief reason for the existence of the welding apparatus in this form. Its very simplicity, however, mocks the efforts of some manufacturers to get an absurd price for their welders. Any motor-generator set in which the generator gives a pressure of approximately 75 volts, with a piece of fence wire for resistance to use in series with the arc, will give results equally as good and be just as economical.

The other type of machine and the machine which ought to be used if saving is the idea, is a drooping characteristic machine which will generate a voltage exactly the same as that required at the arc. In other words, if the arc is short circuited, the voltage will drop to O, and as the arc is drawn, whatever voltage is required across the arc, will be the voltage of the machine. A machine of this kind will pay for itself within a very short time after being put into operation, and it is the only machine which will show maximum economy in work of this kind. Machines of both classes are being manufactured at the present time and are being put on the market.

Now let us see what the comparative costs are on an arc of 150 amperes with the different kind of machines. In order to get this down to a practical, everyday basis, let us consider that current costs 2 cents per kilowatt-hour, and that the arc of 150 amperes is maintained continually.

With the 250-volt supply and merely a resistance the cost per hour will be 75 cents, as 37½ kilowatt-hours would be used. If the constant potential machine were used, the cost would be 30 cents, as 15 kilowatt-hours would be used. With the drooping characteristic machine the cost would be 9 cents per hour, 4½ kilowatt-hours being used. Putting it another way, it might be said that if a resistance is used in series with the 250-volt line, it will take approximately four months to pay for a drooping characteristic welder. If a constant potential motor-generator set is used, it will take approximately eight months to pay for a drooping characteristic machine. In other words, if either of these methods is used, the user will pay for a drooping characteristic welder in the time specified, whether he gets it or not.

The comparative costs when the arc is compared to oxy-acetylene can be found by comparing the heat per dollar of cost as shown above. Any manufacturer that is at present welding, riveting, soldering, brazing, or scrapping metal parts can to very good advantage investigate the possibilities and possible application of arc welding.

National Electrical Contractors' Convention, San Francisco, July 18-25, 1915

Sunday, July 18.—Arrival of special train at San Francisco, 9:55 a. m. Convention headquarters, Clift Hotel, corner Geary and Taylor streets. Convention meeting place, the Auditorium, Market, Hayes and Larkin streets.

Monday, July 19.—Sight-seeing.

Tuesday, July 20.—10 a. m., meeting of directors and executive committee.

Wednesday, July 21.—10 a. m., open session. Address of welcome, president of the San Francisco Association. Address of John R. Galloway, president of The National Electrical Contractors' Association. Address of James Rolph, Jr., mayor of San Francisco. Illustrated address, John Britton, Pacific Gas and Electric Co. Address, Charles C. Moore, director general of the Panama-Pacific International Exposition. Address, W. S. Goodwin, Pacific States Electric Co.

2:30 p. m., business session.

Reception and dance at Clift Hotel, 9 p. m.

Thursday, July 22.—10:00 a. m., business session at Auditorium, Market, Hayes and Larkin streets.

2:00 p. m., automobile ride for women and guests, through Golden Gate Park and Presidio.

2:30 p. m., business session, Auditorium.

Evening, N. E. C. A. Night at the "Zone," exposition grounds.

Friday, July 23.—10:00 a. m., final business session at Auditorium.

2:30 p. m., Board of Directors at Clift Hotel.

3:30 p. m., Executive Committee at Clift Hotel.

7:00 p. m., dinner, dance and vaudeville at Pompeian Court, Hale Building, Fifth and Market streets.

Saturday, July 24.—9:00 a. m., trip by special steamer around San Francisco Bay, and through the Golden Gate, landing at exposition grounds early in the afternoon. Luncheon to be served on board. In a later issue we shall publish full details about special transportation arrangements between the Atlantic and Pacific coasts, and intermediate points.

Electrical Prosperity Week

The committee having in charge the details of arranging for Electrical Prosperity Week has fixed the time of this week to be from Monday, November 29 to Saturday, December 4, 1915. The committee believes that the fixing of these dates will furnish the impetus for a "shop early" sales campaign for Christmas electrical goods. Because of it the department store managers and merchants will begin their extra illumination earlier than usual and allow it to continue without break until Christmas. From month to month we shall keep the trade informed about the plans for this week, as they come from the committee.

COMMON MATERIALS

SUCH AS ARE USED IN MANUFACTURING AND INSTALLING SPECIAL DEVICES. ALL NEW PRODUCTS ARE SHOWN IN THE DEPARTMENT SO NAMED.

No. 35---Screw Machine Products

Articles turned or milled from bar stock on a screw machine, from such metals as iron, steel, and brass, are called screw machine products. A number of screw machine products are considered as being standard. The principal ones are:

Cap nuts
Cap screws
Crown nuts
Milled screws
Milled studs
Set screws
Slotted nuts
Thumb nuts

The majority of screw machine products, however, are made on order, from sketch, blue print, or sample. Samples are usually preferred as they indicate clearly what is wanted. Screw machine products for electrical devices are nearly always made from specifications or blue prints. There seems to be no such thing as a standard screw machine part for electrical uses, for even terminals for dry batteries differ from each other materially. This is true of almost all the screw machine products used in making the multitude of electrical devices that have one or more screw machine parts mounted on them.

All manufacturers of electrical devices use screw machine products in some form, but their principal use is in constructing the following apparatus:

Annunciators
Artificial loads
Batteries (all)
Bells and buzzers
Cutouts
Dynamos
Electrotherapeutical apparatus
Fans
Fire alarms
Flashers
Fuse plugs
Induction coils
Instrument transformers
Instruments (all)
Lighting plants
Lightning arresters
Motors
Phase shifters
Plugs
Receptacles
Rheostats
Rosettes
Sockets
Switches (all)
Switchboards
Telegraph sets
Telephones
Transformers (low voltage)

Screw machine products are also largely used in the making of electrical devices for gasoline automobiles. Some of the largest uses for screw machine parts in this connection are for such devices as:

Distributers
Ignition outfits
Plug coils
Spark coils
Starting and lighting systems
Timers
Vibrators

The screw machine products used in the electrical arts are too numerous to specify in detail. The following are the forms most commonly used: arms, binding posts, bushings, hubs, studs, and terminals.

Few people call the same part by the same name, and in a number of instances no specific name is given to a particular part. Sometimes, too, a part is ordered by number. In knife switches, however, the screw machine products are: cap nuts, studs, and contact nuts. In sockets they are: hubs, binding posts, centre binding posts or terminals, and centre studs.

Molders of insulation are also large users of screw machine products.

The following companies are prepared to turn out screw machine products for the manufacturers of electrical devices:

Allen Mfg. Co., Hartford, Conn.
Wallace Barnes Co., Bristol, Conn.
Chicago Nut Co., Chicago, Ill.
Chicago Screw Co., Chicago, Ill.
Clark Novelty Co., Rochester, N. Y.
Cornwall & Patterson Mfg. Co., Bridgeport, Conn.
Dunbar Bros. Co., Bristol, Conn.
Eastern Machine Screw Corp., New Haven, Conn.
Hartford Machine Screw Co., Hartford, Conn.
Geo. Q. Hill Co., Boston, Mass.
National-Acme Mfg. Co., Cleveland, Ohio.
New Haven Machine Screw Co., New Haven, Conn.
Osborn & Stephenson, Plainville, Conn.
Peck & Young Mfg. Co., Forestville, Conn.
Pittsburgh Screw & Bolt Co., Pittsburgh, Pa.
St. Louis Screw Co., St. Louis, Mo.
Universal Machine Screw Co., Hartford, Conn.

It should be borne in mind in ordering that the manufacturers of screw machine products prefer to have a sample of the part desired. Failing this, a blue print is preferable to either sketch or specifications.

Jovian Prize Contest

A $200 prize contest is announced by *The Jovian*, published by The Jovian Order, Syndicate Trust Building, St. Louis, Mo. The contest is open only to Jovians.

The subject of the article may relate to any branch of the electrical industry—central station, street railway, telephone, electrical engineering, manufacturing, jobbing, contracting, retailing, educational, publishing, and any department of these industries; for example, concerning management production and distribution and their subdivisions, of any of those branches, provided that the article deals with "efficiency." In other words, how to obtain maximum results with minimum effort and expense.

All papers must bear a post-mark from the place of mailing not later than May 15, 1915. It is requested, however, that articles be sent as early as possible.

The names of winners will be announced in the June issue of *The Jovian* mailed June 25.

Articles must be typewritten on one side only of each sheet and must not exceed in length 3,600 words. Two copies of each article must be furnished.

A solid gold and pearl Jovian stick pin will be sent to the author of every article published and not winning one of the above mentioned prizes.

Proctor's 125th street theatre, New York, maintains on the front of the main building what is said to be the largest electric sign in the world. It cost over $5,000, and contains more than 6,000 lamps. It can be seen from the Palisades on the Hudson to the East River.

Rates for Electric Service

If all classes of service were of the same kind there would be little difficulty in arriving at rates that would satisfy the service company and the public, but where the same service is used for various purposes, the rates for the service vary, the public is confused and generally considers that it is being treated unjustly. For example, a man using electricity to light his residence pays a rate of say 10 cents per kilowatt-hour, but a man who uses electric power to run an ice plant may get a rate of 1 cent per kilowatt-hour. Usually no amount of explanation will convince the man paying a rate of 10 cents that he is not being robbed. On the other hand, the man paying the 1-cent rate knows he is getting only a fair rate, and the power company is certain both of them are being treated fairly. Because of the confusion that exists in the minds of the consumers many power companies, especially those supplying lighting to many eastern cities, do not encourage the use of electricity for power, because they believe the lighting consumers will think they should have the same rates, or at least lower rates, than are warranted. As a matter of fact, a thorough understanding on the part of the consumer and the offering of the electric service for all purposes, especially for power, will result not only in some reduction in rates to the lighting consumers, but, what is much more important, the use of electricity for power purposes will stimulate other industries and these will, of course, make the community more prosperous. A prosperous community or individual is never burdened by the lighting bill, as it is insignificant when measured in terms of the service received and the general benefits derived by the community when it has an ample power supply available and used for all purposes.

Electricity for lighting and power purposes cannot be stored in large quantities, therefore the plant must at each instant be ready to generate the total supply. The lighting consumer must, therefore, have available all day the possibility of instant service; but he may use the service only to produce revenue for the company a few hours each evening. This is the usual explanation given for the higher rates charged for lighting; that is, that the lighting consumer uses the light only a few hours per day, whereas the power user's service extends over the larger part of the day, and also the power consumer uses a much greater quantity. The revenue obtained from a consumer having a 100-h.p. motor may be equal to that obtained from a hundred or two hundred lighting consumers. Herein lies the crux of the entire matter, but the consumer does not see it, so we will try another way of explanation.

If, for example, the total of investment and operating expense to serve all the lighting consumers is equal to the total of investment and operating expense to serve all the power consumers, then plainly the revenue derived from each class of service must be the same in order that each may bear its fair share of the expense of the service. In the average up-to-date light and power system the total energy, generally expressed in kilowatt-hours, consumed by the lighting consumers is very much less than the kilowatt-hours consumed by the power consumers. If the power consumers use five times as much as the lighting consumers, then, on the assumption that it costs as much to serve all the lighting consumers as it does all the power consumers, the rate per kilowatt-hour charged the lighting consumers must be five times as large as the rate charged the power consumers. Generally, however, especially when water power is available, and on account of the large cost of distribution, the cost of serving the lighting consumers is greater than the cost of serving the power consumers, so that a greater difference than five to one must exist in the rates for service.

If we assume that the investment cost and operation cost of supplying energy for power consumers is the same as the cost for supplying the lighting consumers, it follows that the revenue derived from the two classes of business should be the same. But if the total energy consumed by the power consumers is five times that used by the lighting consumers, it is evident that the average rate charged per kilowatt-hour for lighting must be five times the average rate charged for power. That is, if the average rate for power is one cent per kilowatt-hour, the average rate for lighting must be five cents per kilowatt-hour. If the company sells 500,000,000 kilowatt-hours for power at an average rate of one cent, it will receive $5,000,000 in revenue. But if the amount of energy supplied for lighting is only 100,000,000 kilowatt-hours the charge must be five cents per kilowat-hour to produce the same revenue.

Always, however, on account of the cost of distribution, the cost of the lighting service is much greater than the cost of the power service, and generally, therefore, we find the lighting rates about ten times the rates for power service. The total investment in the given case, for illustration, may be divided as follows:

Investment for power consumers	$15,000,000
Investment for lighting consumers, to substations	15,000,000
Investment for lighting concumers, for distribution	15,000,000

And the earnings necessary so that each may pay its fair share may be as follows:

From power consumers	$3,000,000
From lighting consumers, to substations	3,000,000
From lighting consumers, for distribution	3,000,000
Total to be earned	$9,000,000

The power consumers may use	400,000,000 kw-hr.
The lighting consumers may use	100,000,000 “

Fair rates would then be:

For power consumers, charges to substations:

$$\frac{300{,}000{,}000 \text{ cents}}{400{,}000{,}000} = 0.75 \text{ cent per kw-hr.}$$

For lighting consumers, charges to substations

$$\frac{300{,}000{,}000 \text{ cents}}{100{,}000{,}000} = 3 \text{ cents per kw-hr.}$$

For lighting consumers, for distribution:

$$\frac{300{,}000{,}000 \text{ cents}}{100{,}000{,}000} = 3 \text{ cents per kw-hr.}$$

This would make the total average rate to the lighting consumer six cents per kilowatt-hour, and the total average rate to the power consumer three-quarters of a cent per kilowatt-hour. If the kilowatt-hours consumed for lighting are 150,000,000, the rate to the substation is two cents per kilowatt-hour, and the total rate four cents. These are the views of F. G. Baum, chief engineer of the Pacific Gas & Electric Co., as expressed in a paper read at a recent meeting of the Pacific Service Section of the N. E. L. A. at San Francisco.

In the above explanation, which the consumer can understand, there is no use of the terms diversity factor and load factor. It puts lighting consumers in one class and power consumers in another, and determines average class rates from the cost of giving service and the amount of energy used by each class of consumer.

It is seen, therefore, that the lighting consumer's rate is much higher than the rate to the power consumer because:

1—The investment and cost of operation to serve the lighting consumer are greater than the investment and cost of operation to serve the power consumer, and

2—Much more important, the total energy consumed by the power consumers is much greater than that used by the lighting consumers *for the same peak demand.*

Condenser in Telephone Circuits

Every telephone makes use of two kinds of current —direct and alternating. Direct current supplies energy for the talking circuit; alternating current supplies energy for operating the signal bell.

When the receiver is on its hook the talking circuit is *open;* that is, no current is flowing through the talking parts of the instrument. Direct pressure is always present in the wires connecting the instrument with the central station, however, so that when the receiver is removed from the hook the talking circuit is closed and direct current permitted to flow. This places the subscriber in direct touch with the central operator.

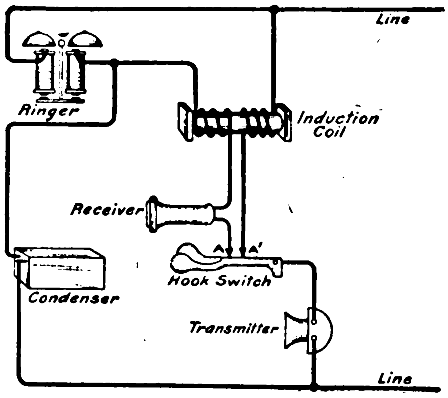


Diagram of connections in telephone circuit. Shows how condenser is connected in to block passage of direct current through bell circuit.

Alternating current is sent over the wires only when the central wants to call a subscriber by ringing his bell. The ringing circuit must always be kept *closed,* so that central may signal merely by turning the alternating current into the bell. Both alternating current for signaling and direct current for talking pass through the same pair of main wires. This saves duplication of service wires.

The direct pressure, which, as stated, is always present in any subscriber's circuit, tries to force current to flow through the ringer even when the receiver is on the hook and the talking parts of the instrument disconnected. The ringer being adapted to alternating current operation only, will not operate by direct current, but nevertheless will furnish a path for the direct current, this allowing it to run to waste. To prevent this waste it is necessary to equip the telephone with a device that will keep the direct or talking current from flowing through the ringer. This device is the condenser. Its function is to guard against the passage of direct current, while allowing ready passage for alternating current. It is a condenser's nature to pass alternating current and to block the passage of direct current.

A current flows into or out of a condenser only when the pressure at its terminals is changing. A condenser will therefore permit the flow of alternating current, the pressure of which varies continuously with respect to time, but will prevent the flow of direct current, whose pressure is constant.

How this property of the condenser serves to prevent a constant flow and subsequent waste of direct current may be seen by reference to the accompanying cut. When the subscriber is not using his telephone, his receiver is on the hook and the talking circuit is opened at A and A'; therefore the only path for electricity is through the ringer and condenser. As the condenser transmits alternating current, it enables central to operate the ringer at the subscriber's station, while at the same time it prevents the flow of direct current through the ringer.

Some Facts About the Telephone

In the report of the engineering department of the American Telephone and Telegraph Co., recently published, it was stated that the first telephone line was a copy of the best telegraph line of the day. It was an iron wire strung on poles and house-tops, using the ground for the return circuit. Electrical disturbances coming from no one knows where were picked up by this line. These disturbances were frequently so loud in the telephone as to destroy conversation. When the second telephone wire was strung alongside of the first, even though perfectly insulated from it, another surprise awaited the telephone man. Conversation carried on over one of these wires could plainly be heard on the other. Another strange thing was discovered—iron wire was not as good a conductor for the telephone current as it was for the telegraph current. The talking distance, therefore, was limited by the imperfect carrying power of the conductor and by the confusing effect of all sorts of disturbing currents from the atmosphere and from the neighboring telephone and telegraph wires.

The hard drawn copper circuit greatly extended the range of transmission, and the metallic circuit, transposed according to the methods devised by the Bell engineers, eliminated the outside disturbances. But this was not to be the state of affairs for long. Powerful electric light and power circuits began to spring up and methods which had formerly been successful in protecting the telephone from disturbing currents were not effective against these new high powers.

It has been said with truth that if these high power circuits had been discovered and in use before the telephone was invented, the results obtained from the first telephone lines would have been so utterly impracticable that it is hard to think of anyone being foolish enough to regard the telephone as having any commercial value.

The metallic circuit and hard-drawn copper wire so greatly improved and extended the telephone service that wires began to increase in such numbers that the use of cables was imperative. A new series of difficulties then arose, one mile of underground cable cutting down the transmission sometimes as much as one hundred miles of overhead wire. How successful has been the attack on the underground wire problem is best shown by the figure of over 9,000,000 miles of wire in underground cable in 1914 as against only a few hundred miles in 1884.

SPECIAL DEVICES

SHOWING ALL TYPES WITHOUT REGARD TO TIME THEY HAVE BEEN ON THE MARKET. ALL NEW PRODUCTS ARE SHOWN IN DEPARTMENT SO NAMED.

No. 29—Electrical Measuring Instruments

Any tool or piece of mechanism is an instrument. The use of the term electrical instruments is, however, usually restricted to the kinds of mechanisms that detect or measure electricity, or indicate its effect. Induction coils, rheostats, fuses, and transformers, for example, are instruments, but they are not classed as electrical instruments. Electrical instruments are known to the Bureau of Standards as electrical measuring instruments.

There are three classes of electrical measuring instruments—indicating, integrating, and recording.

Indicating instruments are those which give directly the value of an electrical quantity at the time of observation, usually by means of a dial.

Integrating instruments are those which record and reckon quantities relatively to time.

Recording instruments are those which draw a curve or other graphic record showing the variation of an electrical quantity with time. Recording instruments are also referred to as curve drawing and graphic instruments.

Electrical measuring instruments might also be classified according to construction and method of use—as portable, switchboard, and laboratory instruments—or may be grouped according to the current on which they are designed to operate.

Frequently it is found that electrical measuring devices are referred to as meters and instruments indiscriminately. It might be well to note here that the Bureau of Standards is authority for the statement that "While the word 'instrument' is a general term which may properly include indicating, integrating, and recording devices, there is a tendency to restrict its use to indicating devices and to recording (graphic or curve drawing) devices. Integrating devices are then denoted by the word meter."

In this article it is proposed to treat of integrating and recording instruments. In an article to be published in the June isse of the Electrical Record, indicating instruments will be discussed, testing instruments being included as a sub-class of indicating instruments. In a third article to be published in the July issue a miscellaneous class of instruments will be discussed. This class, while not a regular class of itself, is so distinct from the three classes referred to in this article, it has been thought advisable to treat of it separately. Included in this last class will be, lamp testing, pocket and vehicle and motor boat instruments. Instrument accessories will also be discussed in this third article.

Accompanying this article is a table giving a list of names given to all classes of instruments, showing the diversity of practice in naming them. Each instrument mentioned in this table will be defined and where two or more names are given to the same instrument this fact will be mentioned. The list of names in the table is divided into the following groups: Recording, integrating, indicating (with subhead of testing), pocket, vehicle and motor boat, lamp testing, pipe locating, and sound locating instruments. A list of kindred devices, in the nature of instruments and usually referred to as instruments, is also included, as is also a list of instrument accessories.

RECORDING ELECTRICAL INSTRUMENTS

Recording electrical instruments, often referred to as curve drawing and graphic instruments, are those which make a record of the varying values of current, voltage and power, in a circuit in which they may be connected. Almost any of the types of indicating instruments may be utilized in the design of a recording instrument. In many cases they are called by the same name as the indicating instrument which they approximate, preceded by the word recording, as for example—recording ammeter, recording voltmeter, and recording wattmeter. The names of the recording instruments are given in the table.

Autographic recorder—This is a name sometimes used to designate a telegraphic recorder, or a syphon recorder by which a record is made. Any recording instrument that has a pen which draws a line is an autographic recorder.

Demand indicator—See Printometer.

Graphic instrument—Also called graphic meter. Graphic instruments are ammeters, voltmeters, and wattmeters, designed for making accurate and permanent records of the electrical quantities involved in power house operation. Same as recording ammeters, recording voltmeters, and recording wattmeters.

Printometer—A printometer is an instrument for recording the reading of a watthour meter at regular intervals on a continuous paper tape. It is not in itself a meter, but is an instrument that can be electrically connected with any watthour meter by means of simple changes in the meter register. Also called demand indicator.

Recording ammeter—An ammeter is a device that measures and indicates the strength of currents in amperes directly. A recording ammeter is one which makes a permanent record of its indications.

Recording milli-ammeter—A milli-ammeter is a device serving to indicate in one thousandths of an ampere, the strength of a current in the circuit to which it is connected. A recording milli-ammeter is one which makes a permanent record of its indications.

Recording voltmeter—A voltmeter is a device that serves to indicate the electrical pressure in a circuit. A recording voltmeter is one which makes a permanent record of its indications.

Recording wattmeter—A wattmeter is a device serving to indicate the power of a circuit in watts. A recording wattmeter is one which makes a permanent record of its indications.

Self-registering tachometer—A tachometer is a device for measuring the velocity and variations of velocity of machines and shafts and indicating on a dial the number of these revolutions per minute. A self-registering tachometer is one which makes a permanent record of its indications.

Totalizing graphic instrument—Also called totalizing graphic wattmeter. A totalizing graphic instrument is a combination of a number of wattmeters connected together and used for measuring the total power in a group of from two to twelve independent circuits and making a permanent record of its indications. By this method it is possible to record on one meter the total power in several circuits which are not in synchronism or which have different characteristics such as frequency, transformer ratio, and voltage.

INTEGRATING ELECTRICAL INSTRUMENTS

Integrating electrical instruments, now more generally known as integrating electrical meters, are

List of Names Given to Various Classes of Electrical Measuring Instruments

Showing the Diversity of Practice in Designating Instruments

Recording (Curve drawing and graphic)

Autographic recorders
Demand indicators
Graphic instruments (meters)
Printometers
Recording ammeters
Recording milli-ammeters
Recording voltmeters
Recording wattmeters
Self-registering tachometers
Totalizing graphic instruments

Integrating

Amperehour meters
Maxicators
Maximum demand indicators
Maximum watthour demand meters
Prepayment watthour meter
Watthour meters

Indicating

Ammeters
Automatic liquid indicators
Cent-hour meters
Current indicators
Differential voltmeters
Double reading meters
Duplex meters
Electrostatic ground detectors
Electrostatic voltmeters
Energy meters
Erg meters
Excess indicators
Frequency meters
Ground detectors
Hot wire instruments
Illuminometers
Milli-ammeters
Milli-voltmeters
Pressure indicators
Phase indicators
Phase rotation indicators
Polarity indicators
Potential indicators
Power factor meters
Reactive factor meters
Speed indicators
Synchronizers
Synchroscopes
Tachometers
Voltmeters
Volt-ammeters
Voltameters
Wattless component meters
Wattmeters
Zero centre meters

Indicating (testing)

Battery testing sets
Bond testers
Cable testing sets
Calibrators
Comparators
Conductivity bridges
Core loss testing sets
Ducters
Electrolysis testing meters
Electrodynamometer voltmeters
Electrometers
Fault finders
Fault localizers
Fault spotters
Fire alarm bridges
Galvanometers
High potential detectors
Iron loss voltmeters
Iron testers
Magnetometers
Meggers
Magnetmeter
Megohm instruments
Ohmeters
Oscillographs
Permeability meters
Potential dynamometers
Potentiometers
Resistance bridges
Reverse current relays
Rotating standards
Rotating test meters
Sine galvanometers
Slide bridges
Tangent galvanometers
Test sets
Testing meters
Trouble finders, armature and field
Wheatstone bridges

Pocket

Ammeters
Battery gauges
Coil testers
Galvanometers
Volt-ammeters
Voltmeters

Vehicle and Motor Boat

Ammeters
Amperehour meters
Voltmeters
Volt-ammeters

Lamp Testing
(to insert in socket)

Photometers

Pipe Locating

Pipe locaters
Telepipes

Sound Locating

Sonoscopes

Kindred Devices, Termed Instruments But Not Electrical Measuring Instruments

Electroscopes
Hydrometers
Micrometers
Operation indicators
Pole measurers
Polarity changers
Phase shifters
Photometers
Pyrometers
Radiometers
Register meters
Salimeters
Sechometers
Sine wave oscillators
Speed counters
Speed recorders
Speed and direction indicators
Speedometers
Selenium cells
Spherometers
Steam flow meters
Storometers
Tachographs
Telephone registers
Thermometers
Telegraph sets
Voltage regulators
Wire gauges
Wireless telegraph sets

Some Instrument Accessories

Artificial (phantom) loads
Circuit breakers
Condensers
Current transformers
Instrument transformers
Resistances
Resistance coils
Shunts
Spark gaps

those devices which record and reckon quantities relatively to time. The names of the integrating meters are given in the table.

Amperehour meter—An amperehour meter is a device which measures the product of the average current in amperes by the time in hours. It will be noted that the word amperehour is here printed without a hyphen. On this subject the Bureau of Standards says: "The question has frequently been raised as to why the bureau has not used 'amperehour' as a single, unhyphenated word as in the case of 'watthour.' This seems entirely reasonable, and there can be little doubt that the use of this form will in time become universal. The Sangamo Electric Co. throughout its recent literature uses 'amperehour,' and the Meter Committee of the N. E. L. A. is also adopting it. The bureau, too, is using this form in the new edition of its Circular 20."

Maxicator—See maximum demand indicator.

Maximum demand indicator—A maximum demand indicator is a device for showing the maximum demand or cost to serve. It is similar to the register of the ordinary watthour meter and is designed to be mounted in place of a watthour meter register. It has four dials which register the total kilowatt-hours consumption, the same as a regular watthour meter. In addition to these dials there is a fifth and larger dial, and by means of a large center hand or pointer there is indicated on this large dial the measured maximum demand during 30 or 15 minute intervals over any period, as, for instance, a week or a month. It is also called a maxicator.

Maximum watthour demand meter—A maximum watthour demand meter is a single watthour meter that records both the kilowatt-hours consumed and the maximum kilowatt demand. Used for determining maximum demand and loss factor as a basis for rates, as well as the diversity factor of the station. Similar to the maximum demand indicator.

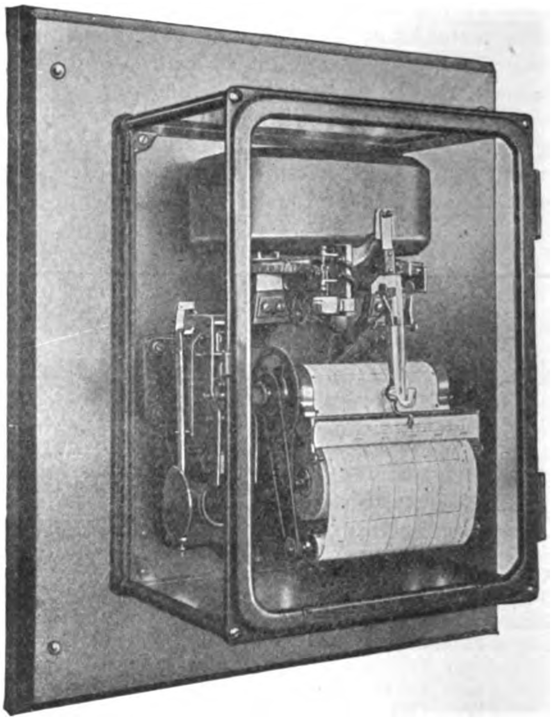
Prepayment watthour meter—Often referred to simply as prepayment meters. A prepayment watthour meter is the quarter meter of the central station, corresponding to the quarter meters used by the gas companies. It is designed to permit of the depositing of coins by which prepayment of a definite amount of electrical energy may be effected. They are watthour meters.

Watthour meter—A watthour meter is a device that measures and indicates the whole power in watts or kilowatts that passes through it relatively to time. Although it measures in kilowatts it is rarely spoken of as a kilowatt hour meter. In the past it has, however, been often referred to as an integrating wattmeter, or simply as a wattmeter. Both these terms are now obsolete. It is the opinion of the Bureau of Standards that the correct way of designating such devices is by the term "watthour meters."

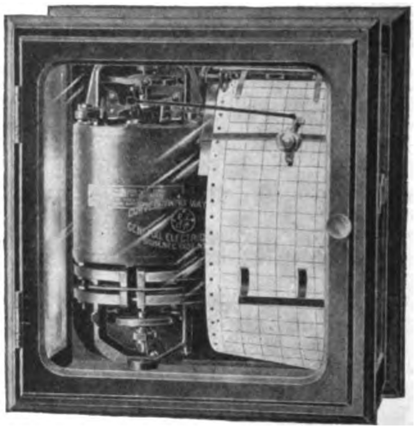
ILLUSTRATIONS

The various types of recording and integrating instruments mentioned in the text are illustrated herewith. The captions under the cuts give detailed information regarding the type of instrument shown and its characteristics.

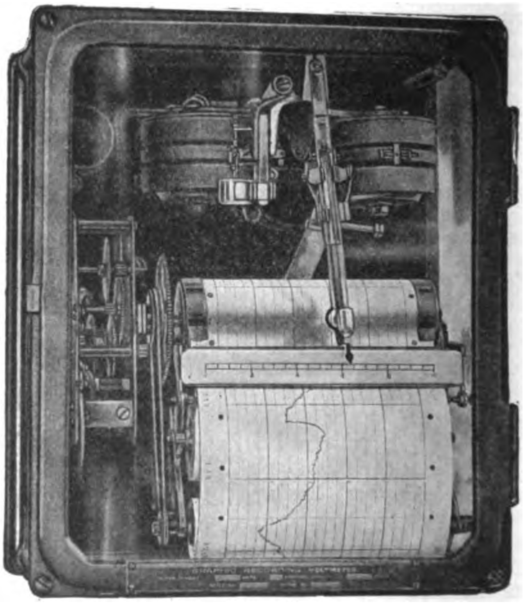
For detailed information in regard to the construction and operation of electrical measuring instruments readers are referred to Circular No. 20 on Electrical Measuring Instruments, issued by the Bureau of Standards at Washington, D. C.



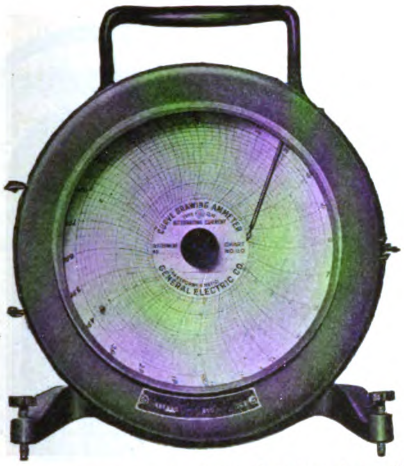
Graphic (recording) wattmeter, for direct current circuits. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



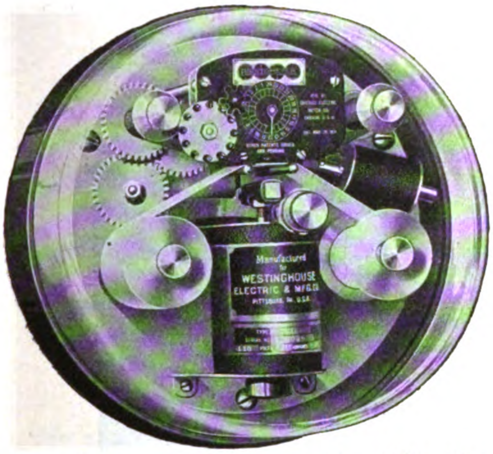
Polyphase, curve drawing (recording) wattmeter, for alternating current circuits. General Electric Co., Schenectady, N. Y.



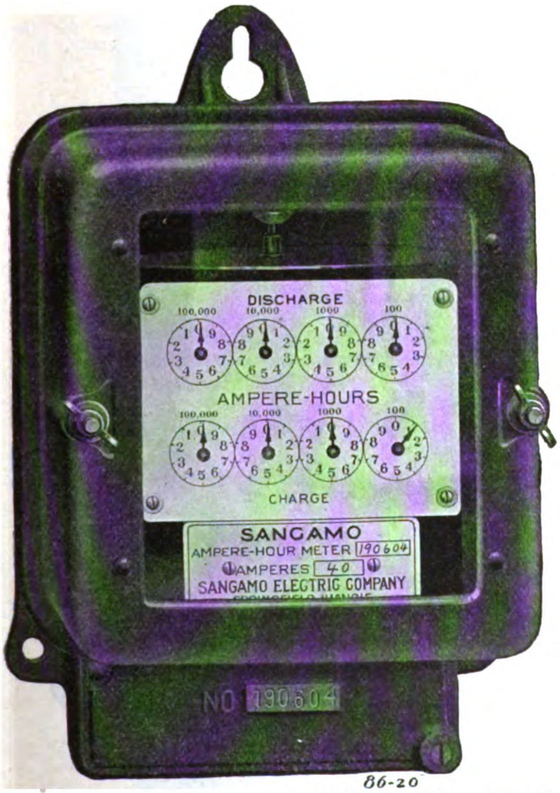
Graphic (recording) voltmeter, for direct and alternating current circuits. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



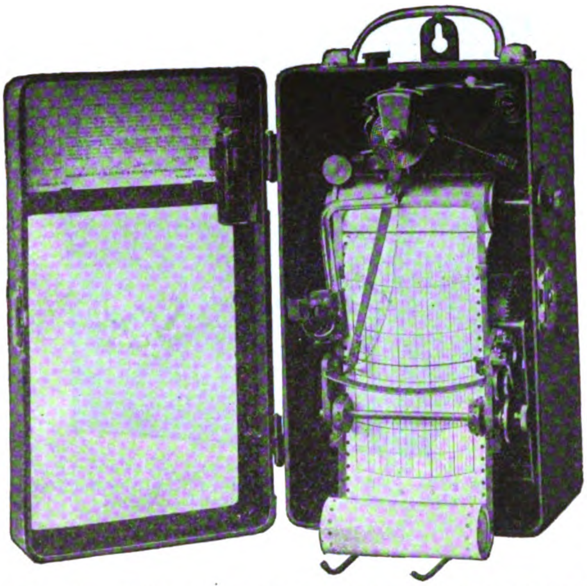
Portable type, alternating current, curve drawing (recording) ammeter. General Electric Co., Schenectady, N. Y.



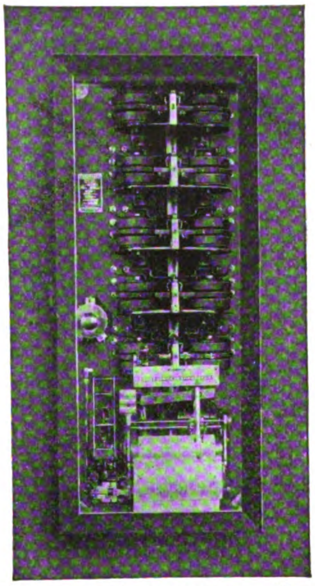
Printometer, an instrument for recording the reading of a watthour meter at regular intervals, on a strip of paper tape. Also called a watt demand indicator. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



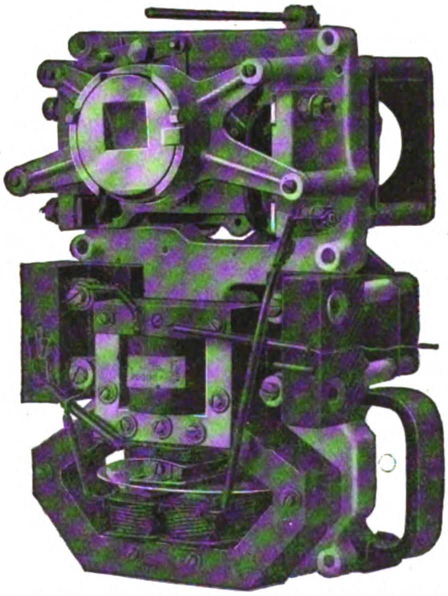
Service type amperehour meter with duplex totalizing dials, for use where it is necessary to keep a record of both charge and discharge amperehours. Sangamo Electric Co., Springfield, Ill.



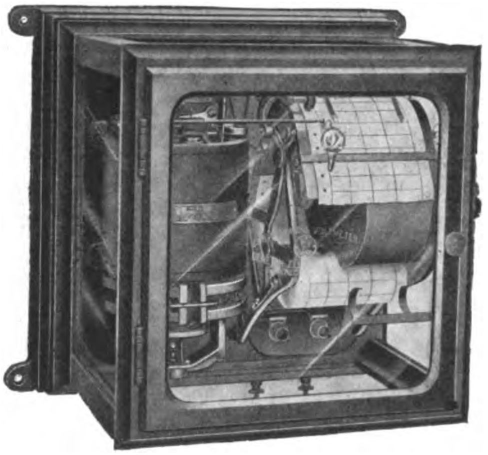
Portable and switchboard graphic instrument—voltmeter or ammeter. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



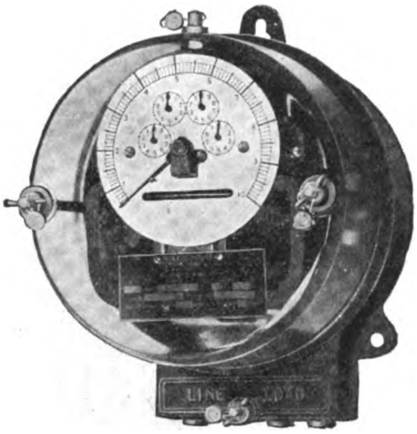
Five circuit, totalizing, graphic wattmeter, with multpilying switch. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



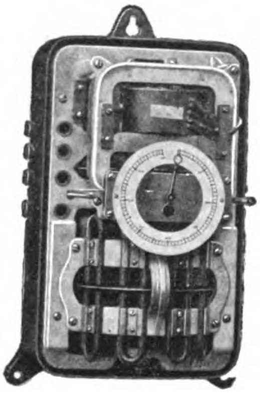
Interior of prepayment watthour meter for alternating current circuits. General Electric Co., Schenectady, N. Y.



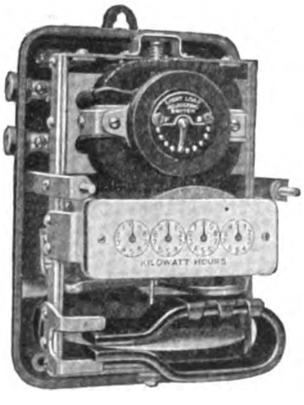
Switchboard type, front connected, curve drawing (recording) voltmeter. General Electric Co., Schenectady, N. Y.



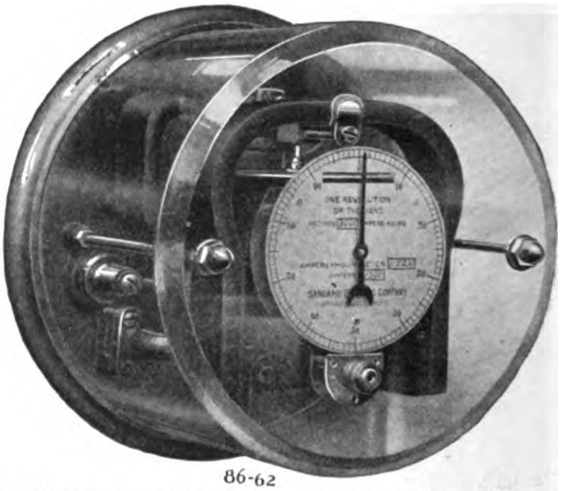
Single phase, watthour demand meter, with glass cover. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



Polyphase, maximum watt demand indicator, with cover removed; circular dial. General Electric Co., Schencetady, N. Y.



House type, watthour meter, for direct current service; equipped with light load compensating switch; dial in centre of cover. Duncan Electric Mfg. Co., La Fayette, Ind.



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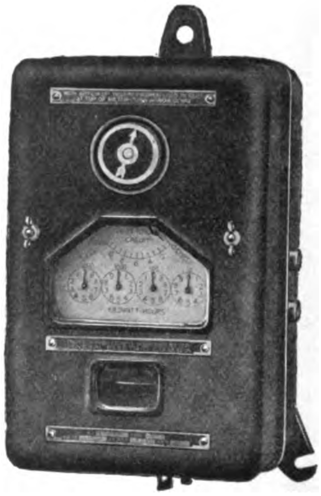
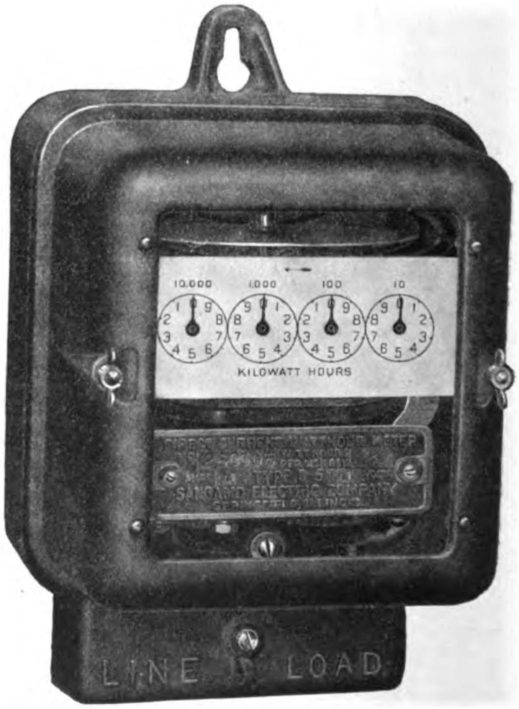
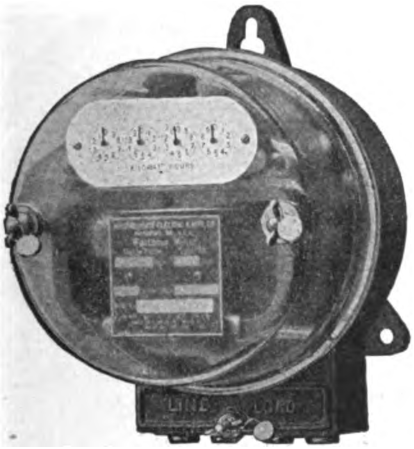
Switchboard type amperehour meter, with circular dial, for use where the instantaneous condition of a battery is important. Sangamo Electric Co., Springfield, Ill.



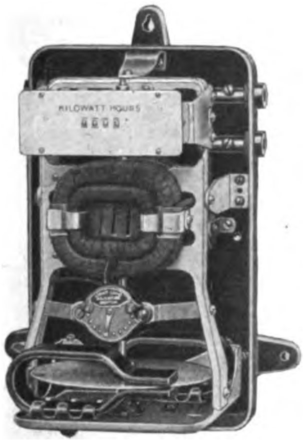
House type, high torque prepayment, watthour meter for alternating current circuits. General Electric Co., Schenectady, N. Y.



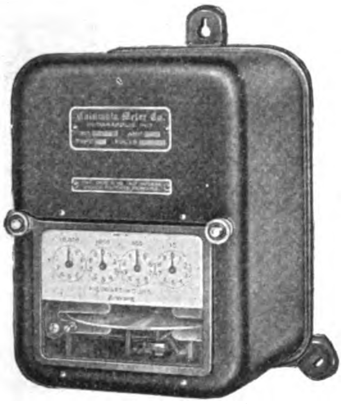
Service type, mercury, watthour meter, for two wire, direct current circuits. Sangamo Electric Co., Springfield, Ill.



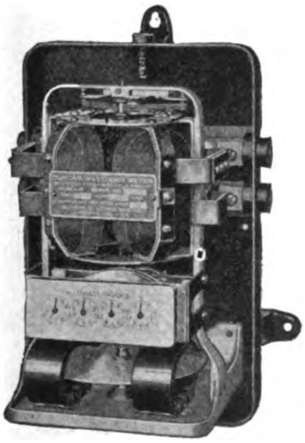
Single phase, house type, prepayment watthour meter, with glass cover. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



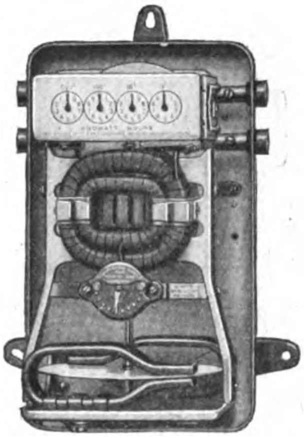
Cyclometer dial, watthour meter, for direct current serivce. Duncan Electric Mfg. Co., La Fayette, Ind.



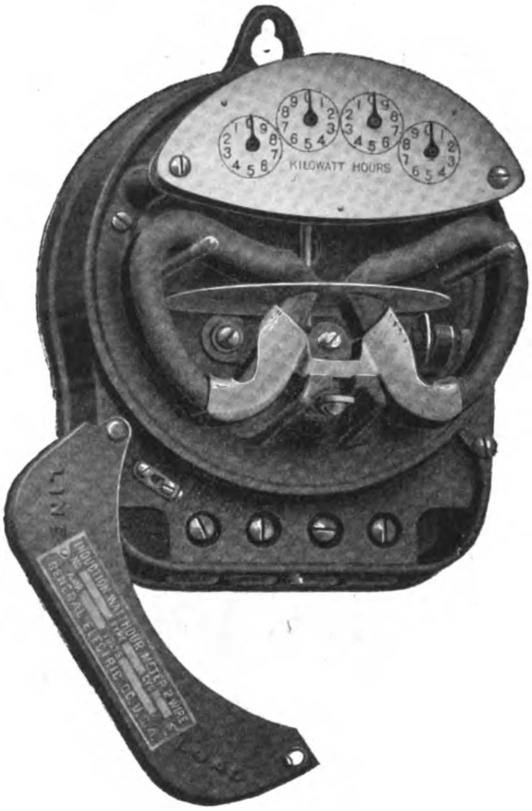
House type, commutator, watthour meter for 100 to 550 volts, direct current circuits, two and three wire. Roller-Smith Co., 203 Broadway, New York.



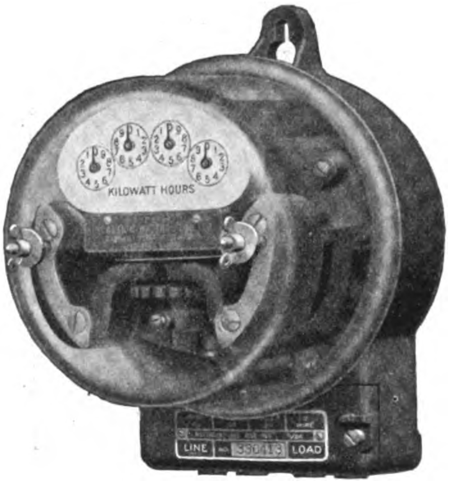
Shunted type watthour meter for 110, 220, or 500 volt, direct current circuits. Duncan Electric Mfg. Co., La Fayette, Ind.



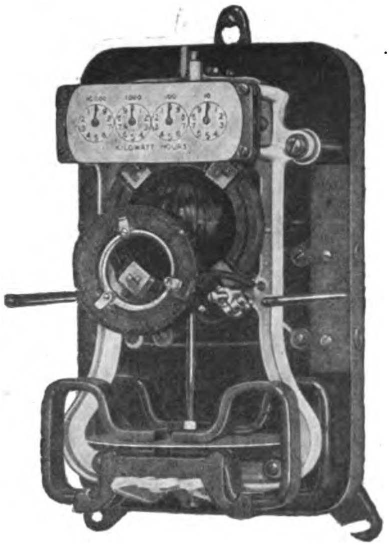
House type, watthour meter for direct current circuits, with dial at top of cover; equipped with light load compensating switch. Duncan Electric Mfg. Co., La Fayette, Ind.



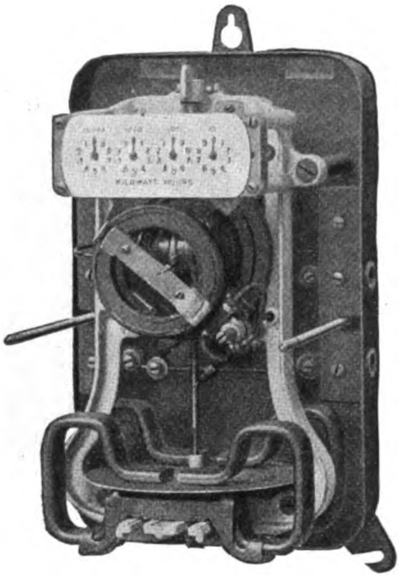
Induction watthour meter, for single phase, alternating current circuits; cover removed and terminal cover open. General Electric Co.. Schenectady, N Y.



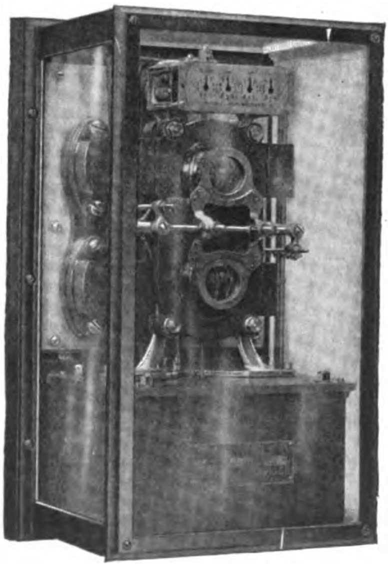
Induction watthour meter, for single and polyphase, alternating current circuits. Sangamo Electric Co., Springfield, Ill.



Commutator, house type, watthour meter for direct current circuits, with dials at top of cover. General Electric Co., Schenectady, N. Y.

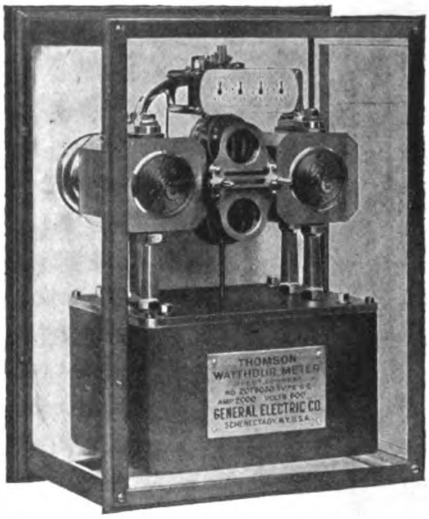


Commutator type, watthour meter, for direct current circuits. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

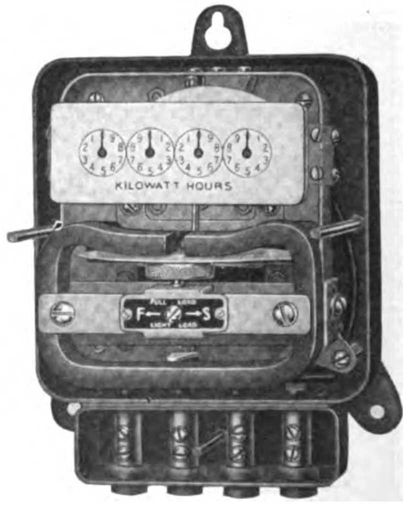


Direct current, astatic, watthour meter for switchboard service. General Electric Co., Schenectady, N. Y.

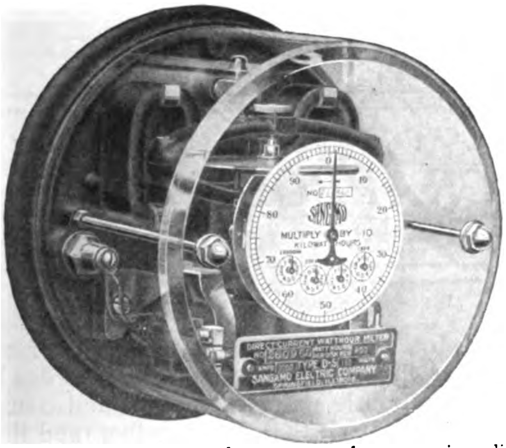
Polyphase watthour meter, for alternating current circuits, with metal case. Sangamo Electric Co., Springfield, Ill.



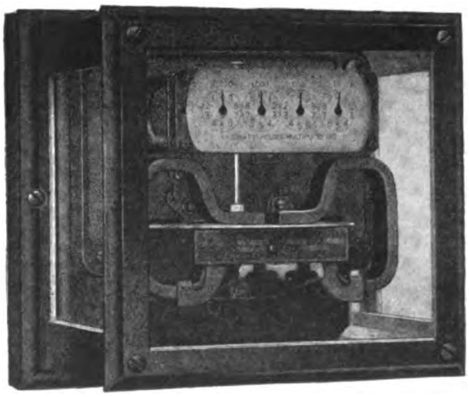
High capacity, astatic watthour meter for switchboard service. General Electric Co., Schenectady, N. Y.



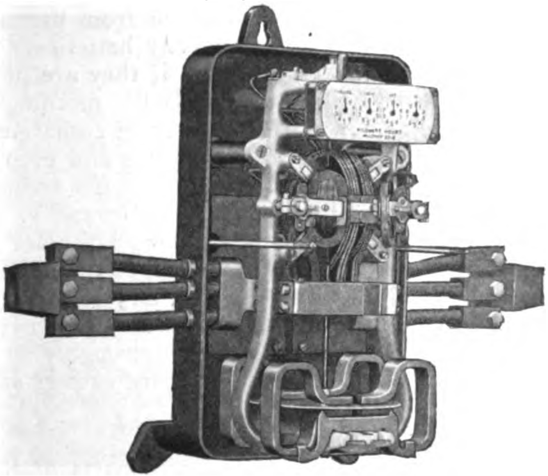
Induction type, watthour meter, for alternating current circuits. Duncan Electric Mfg. Co., La Fayette, Ind.



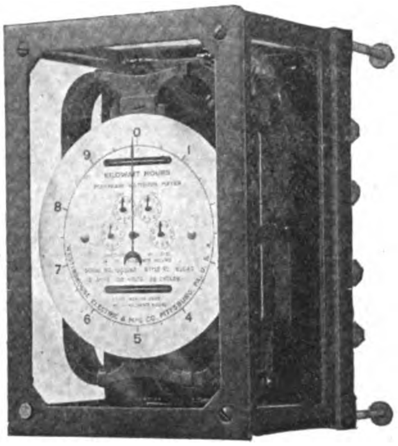
Switchboard type, mercury, watthour meter, for two wire, direct current circuits, with circular dial. Sangamo Electric Co., Springfield, Ill.



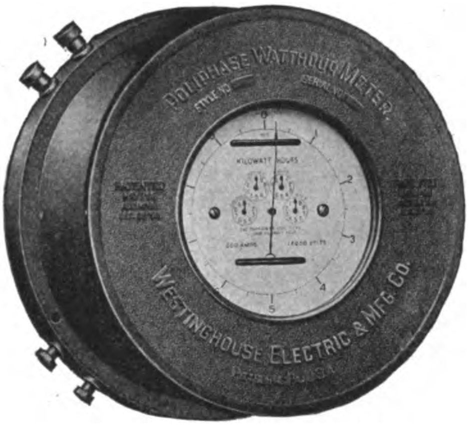
Single phase, high torque, watthour meter for Switchboard service, on alternating current circuits. General Electric Co., Schenectady, N. Y.



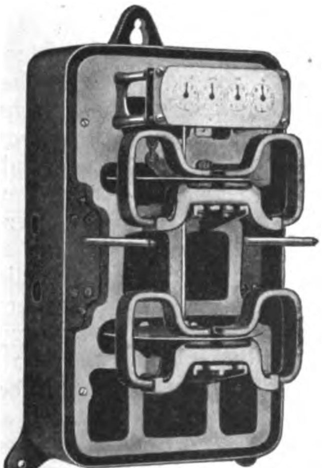
Shunt, watthour meter, for direct current circuits. General Electric Co., Schenectady, N. Y.



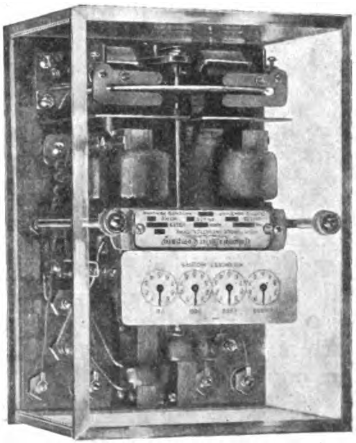
Polyphase, watthour meter, switchboard type, with circular dial. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



Polyphase, switchboard type, watthour meter, with circular dial. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



Polyphase, watthour meter for house service. General Electric Co., Schenectady, N. Y.



Shunted astatic watthour meter, switchboard type, for two or three wire, direct current circuits. Roller-Smith Co., 203 Broadway, New York.

CONTRACTORS' SCRAPBOOK

A paste made up of 4 oz. of pumice (pulverized), 2 oz. of dextrine, and 10 oz. of water is given as an effective means of sealing a puncture in a tire, the paste being forced into the tube through the valve, after the "insides" have been withdrawn, by means of a small metal filler, after it has been punctured. It is claimed that this paste will close a good-sized hole and enable one to continue for many miles without detaching the tire; in fact, in one case a tire so "repaired" is said to have remained fully inflated for a week. When the tube is patched care should be used to see that all of the paste is removed from it.

To stop spattering solder on finished floors when hanging fixtures, the author of Soldering Kink No. 44 published in a broadside issued by the M. W. Dunton Co., of Providence, R. I., finds that when hanging fixtures in a finished house tissue paper over a piece of heavy wrapping paper makes the best kind of a protection for the floors or carpet. By using the paper which comes around the fixtures from the supply house this makes a convenient and inexpensive protection for floors. The tissue paper prevents hot solder from spreading and flying around as it will if it drops on a hard paper, and the thick tough paper underneath prevents the solder from striking through. Tissue paper may also be used to advantage to lay over the canopy, arms, or other parts of large ceiling fixtures to catch any solder that may drop.

Electrical contractors looking for information on welding apparatus and methods will find much to interest them in a bulletin entitled "Variable Voltage Arc Welders," which has just been published by the Welding Materials Co., Inc., 114 Liberty street, New York.

Thomas E. Hopson, 134 Bank street, Ottawa, Ontario, has just brought out a new flexible tubing fastener. It is made of single sheet steel 1/16 inch thick and 1 7/16 inch square. When folded ready for use it is held in place by a 1¼ inch No. 8 wood screw. Two spurs punched in the bottom prevent the clamp from turning. He wishes to dispose of the right to make and sell this device in the United States.

Dry batteries which have become exhausted, says the *Penberthy Engineer & Fireman*, can be recharged by a very simple process. Remove the outer cardboard casing from each cell and drill six small holes in the zinc casing about one inch from the bottom. As four cells are generally used for ignition purposes in connection with the induction coil, get four small glass or stone jars an inch or so larger in diameter than the cells and about three-quarters the height of the same. Dissolve about a half an ounce of powdered sal ammoniac in each jar, in a sufficient quantity of water to bring it almost to the top of the jar when the cell is in it. Get four cells of gravity battery and put them in series with each other by connecting the zinc element of one cell to the copper element of another. Put each dry battery cell in the solution in its respective jar and connect the three binding posts on the zincs together, and the three carbon posts also, by means of insulated copper wire. Then attach the wire from the zincs to the zinc element of the gravity batteries and the wire from the carbons to the copper element of the gravity batteries. Allow the cells to remain over night, and if they are of good, reliable make they will be found in the morning to be almost as good as new. This process of recharging dry batteries can be repeated at least twice and even three times, but of course, after each successive recharging, their renewed life will be shorter than formerly. After the batteries have been recharged the small holes which were drilled in the casing can be stopped by means of a strip of adhesive tape, covered with bicycle tire cement, and tightly wrapped around the zinc casing over the holes. The cells should be wiped thoroughly dry and then may be replaced in their cardboard casings and are ready for use.

Real babbitt metal consists of 88.9 parts of tin, 7.4 parts of antimony, and 3.7 parts of copper. The properties which make babbitt valuable are its power of accommodating itself to a hard, unyielding surface, its capacity of taking a polish, its power of resisting certain chemicals. Variations in the genuine metal are limited, but the commercial grades sold for babbitt metal are various; in some of the cheaper grades there is no tin in the mixture. A cheap metal with a lead or zinc base, well made, may give better service than a more costly metal which has been carelessly mixed.

Motors for operating electric elevators have one series and two shunt windings. At starting all the windings are connected. One shunt winding is connected all the time the motor is operating, and the other shunt winding is connected when the motor is stopping.

In an article by the lamp committee of the N. E. L. A., published in a recent issue of the *Bulletin*, it is recommended that central stations in changing over to the new type of lamps replace the lower candle-power lamps (32 and 40) with lamps of 60 candle-power, inasmuch as the wattage consumption of the latter lamp is only slightly in excess of those of lower candle-power. This policy has rather generally been adopted by the larger companies, substituting 60 candle-power lamps for the 32 and 40 candle-power vacuum lamps previously supplied, while the 100 c.p. is replacing the 80, and the 250 naturally replacing the 200 c.p. It would seem as though the 60 c.p. lamp should be the minimum candle-power to be standardized for street lighting. It is estimated that up to date upwards of 300,000 lamps of this new construction have been successfully used for street lighting throughout the United States.

CONTRACTORS AND DEALERS NEWS

The Electrical Contractors' Association of New Jersey at its recent ninth annual convention, indorsed a bill providing for the segregation of the electrical work from that of other parts of a building contract. It is proposed to have the bill introduced in the legislature in the near future. The following officers were elected: president, E. P. Strang, Camden; vice-president, C. R. Newman, Passaic; treasurer, P. H. Jaehnig, Newark; secretary, John Van Dyke, of Asbury Park.

O. I. Cooley in the electrical contracting business, 159 Main street, New Britain, Conn., writes that during the month of March the New Britain building inspectors had issued permits representing a building investment of $350,000. Included in this sum is the cost of putting up a large school building. As announced elsewhere in this issue, the public service companies of New Britain have been ordered to remove all overhead wires in West Main street. Subways to hold these wires are now being built. This means more business for the contractor, as all meters have to be placed in cellars and ducts extended to meet the subway ducts. Mr. Cooley has contracts for wiring and installing fixtures in a number of houses: single, two family, and three family. He reports business good and collections fair.

Stuber Bros., electrical contractors, of Winfield, Kansas, have recently installed a number of small farm lighting plants. They make a specialty of farm lighting and small municipal plants.

The contract for the electrical work in a new house in Bank street, New Britain, Conn., has been let to the Dolan Electric Co., 89 Arch street, New Britain. This contract includes wiring and fixtures. Commenting on electrical contracting business in that town the company says:

> Work is pretty good at present, owing to the fact that the subway is going through the principal street in New Britain. The electric light company takes down all overhead feeds and works from the underground, thus making many changes in the wiring of the residences. We have a number of these contracts. There are several contractors in New Britain who have agreed to wire a house complete with a set of fixtures for $45. We are one of this group and are quite busy.

The new garage in Main street, Wheeling, W. Va., to be occupied by Balzer & Balzer, will be wired for lights and electric elevator by the McKelvey-Ewing Electrical Co., Market and 10th streets, Wheeling. This concern is also wiring a residence at Woodlawn for Mr. Martindale, and the new Rogers Hotel, a new six-story building with modern equipment.

The United Electric Co., Kansas City, Mo., reports the following contracts on hand: Insurance Building, at 27th and Wyandotte streets. Frank Adam panelboards will be used exclusively on this job; Hotel Sawyer, 10th and Locust streets; and a six apartment building at 37th street and Broadway, all at Kansas City. All these jobs to be done in conduit as per local requirements.

Shepard & Close, electrical contractors at 44 Hill street, New Haven, Conn., report plenty of work in hand and ahead in and about New Haven. Among the more recent of their contracts are the following: an 8-room school house at Whitneyville, wired in conduit, with regulation fire bells; Warner & Sperry shop, equipped with motors to replace shaft and belt drive, the motors, of General Electric and Crocker-Wheeler make, ranging from 1 to 20 h.p.; Bauman Rubber Co., 494 Congress street, New Haven, General Electric and Crocker-Wheeler motors to operate different machines.

Among the recent contracts awarded to E. F. Higgins & Co., 849 Tatnall street, Wilmington, Del., are the following: Residence in Gordon Heights, a knob and tube job; National Table Waters Co., Kiamensi, Del., including about fifteen motors ranging from 1 to 10 h.p., making the machinery individual drives. The electrical construction will be installed in conduit. It includes some underground work to a reservoir some distance from the plant, wherein a 10-h.p. motor will be installed for the pumping; conduit system in public school at Pennsgrove N. J.; conduit system in high school at Salisbury, Md.; knob and tube system in armory at Newark, Del.; moving picture theatre at Wilmington; complete system of Connecticut intercommunicating telephones and intricate system of call bells at U. S. Engineers Office, Sixth and King streets; conduit system at Friends' Meeting House Tenth and Harrison streets; considerable other small motor work, ranging from 1 to 5 h.p. mostly in 3-phase.

A new electrical contracting firm, located at 16 Sherman street, Huchinson, Kansas, is called the Cates Electric Co.

William Quinlan, Post road, Larchmont, N. Y., reports the following contracts in hand: N. T. Guernsey's residence, Greenwich, Conn., Greenfield duct; Clarence Sackett's residence, Rye, N. Y., BX cable; Geo. S. Dearborn's residence, Rye, N. Y., BX cable; Dr. J. F. Hasbrouck, residence, Bronxville, N. Y., BX cable; Wm. Courtney's residence, Harrison, N. Y., BX cable; Chas. G. Witherspoon's residence, Larchmont, N. Y.,BX cable; Rudolph J. Schaefer, pipe; F. Ullrich Eck's residence, New Rochelle, N. Y., BX cable; Apawamis Club, alterations and additions, pipe.

The F. E. Newbery Electric Co., of St. Louis, Mo., reports the following contracts in hand: Missouri Athletic Association Building, to be wired for light and power, also ventilating system; Baptist Seminary, wired for light and power. Bryant Call systems will be used on this job; Columbia transfer station, of St. Louis; General Chemical Co., of East St. Louis, Ill., new plant wired for light and power. The contract calls for some heavy electrical machinery. This concern is also wiring the Union Stations, at Joplin, Mo., and Memphis, Tenn.

V. H. Effinger, electrical contractor formerly located at 155 East Kibby street, Lima, Ohio, has incorporated for $10,000 and has moved into new and larger quarters at 704 South Main street. Work under way at present includes the Holmes Block and the new Lima Trust Co. bank building at South Lima.

The Cronin Whaley Electric Co. is the name of a new electrical contracting and motor repair company located at 1010 North Third street, St. Joseph, Mo.

Thomas J. Daly, electrical contractor, has removed from Harvard square, Cambridge, Mass., to 1284 Massachusetts avenue, Cambridge, Mass. He has the contract for installing electric light and telephone systems in the home of Charles E. Fay, of the Ford Motor Car Co. This is to be a rigid conduit system throughout for both house and garage. All of the principal rooms in the house and garage will be connected by a private intercommunicating system of telephones. A stationary vacuum cleaner of the Arco type will be installed in the cellar, which will be controlled by a number of switches throughout the house.

Ryan & Dippel, formerly associated with L. K. Comstock Company have opened up an office at 52 Vanderbilt avenue, New York, as electrical engineers and contractors.

Wm. G. Reuter, 34 East Sixth street, Cincinnati, Ohio, reports a number of electrical contracts on his books of which the new plant of the Western Methodist Book Concern is an important item. This work consists largely of heavy power feeds and motor circuits for printing presses. A "safety first" feature of this layout will be an emergency switch at each press that will throw a circuit breaker, stopping all machines on that floor in each department in case of accident, to prevent injury to the operator or machine. The Christ's Hospital signal system is rapidly nearing completion. More additions to the General Hospital fixture equipment is helping to keep him busy.

The Electric Equipment Co., Springfield, Mo., has completed the power installation at the plant of the Herman Sanford Saddle Co., installing 19 Century and General Electric motors from ¼ to 3 h.p. This company is installing 35 motors at the United Iron Works.

In 1910 A. Edgar Goetz started his electrical activities in small quarters at 39 Cortlandt street, New York. Since that time his business has outgrown three successive offices. He is now about to move to new quarters at 55 Barclay street, running through to 56 Park place, making one of the largest areas handling electrical supplies and repairs in the downtown district of New York. Mr. Goetz does a general electrical business, and if specializing could be emphasized, it might be found in the departments of special lighting fixtures and general motor repairs, including alternating current and direct current motors. He has the only shop in New York equipped with single phase and two phase alternating current and also direct current. These are for repairs and testing.

W. R. Hogaboom, electrical contractor, of Wichita, Kansas, has completed the power installation at the Stephens & Bretch Co.'s new isolated plant. One direct-connected steam turbine-generator and seven motors, totaling 27 h.p., were installed here. The company also wired the entire plant for light and power in conduit.

The Woehler & Noble Electric Co., 706 West Lake street, Minneapolis, is completing the wiring in the new Calhoun Commercial Club, a 6-story and basement building wired in conduit.

The Electric Shop, G. A. Hill & Bro., proprietors, 119 East Third street, Dayton, Ohio, has finished wiring the Bracken County court house, at Brooksville, Kentucky. This is a three-story and basement building, the electrical installation consisting of a 16-circuit panel, 65 openings, and 29 switches wired complete in concealed conduit.

G. A. Sieber, electrical contractor, at Jacksonville, Ill., has secured the contract for installing 90 three-lamp cluster white way poles in Jacksonville. The poles will be furnished by the King Foundry Co., of St. Joseph, Mo. M. B. Austin Co. steel covered safety three white cable will be used. The lighting system will be controlled from the central station. The system will be completed and in operation by June first.

The Nugent Electric Co., 511 Minnesota avenue, Kansas City, Kansas, has been awarded the contract to install the electric lighting plant in the Wyandotte County Poor Farm, at Kansas City.

The Pickard Electric Co., 1323 Grand avenue, Kansas City, Mo., manufacturer and dealer of lighting fixtures, has added a supply department and will sell a complete line of electrical supplies.

The Terrell-Hedges Co., of Chattanooga, Tenn., has the contract for the electrical work in the Post Office at Georgetown, Ky. This company also has the contract for furnishing the electrical equipment and motors to lift the steel portion of the Hamilton County bridge, across the Tennessee River, the contract amounting to about $4,000. The equipment includes Westinghouse motors, signals, and switchboard devices.

The New Haven Yacht Club, which was to open May 30, but was burned out above the first floor recently, will be rebuilt at once. The club opening will only be delayed 11 days, being set for June 10. Shepard & Close, New Haven, will do the electrical work here.

Fred D. Retallick & Co., 26 Dunham street, Pittsfield, Mass., will wire and equip the Dawes School at that place. The wiring will be done in iron conduit. The equipment includes Standard Electric Time Co.'s electric secondary, master and programme clocks, fire alarm system, vacuum cleaning system, and Samson telephone system. Everything known for the safety, convenience, and comfort of the pupils and teachers will be installed in this building. This job is in the addition to the original Dawes School which was wired by Retallick & Co. some seven years ago.

James G. Mitchell, 2637 South 15th street, Philadelphia, Pa., has the electrical contracts for the United States post offices at Jellico and Cookeville, Tenn. These will be all-conduit jobs, for lights, telephones, and vault protection.

W. E. Throop & Co., 144½ Main street, Bristol, Conn., will wire and equip the new high school at Bristol. About five tons of conduit will be used in this job. The equipment includes 30 telephones, 24 standard time clocks, a master clock, three 10-inch Holtzer-Cabot fire gongs on the outside of the building, and four 18-inch trip gongs on the inside. The fixtures will be selected later.

The new Weathersfield Avenue School now being erected in Hartford, Conn., is a three-story fireproof building with a two-phase, 400-ampere, five-wire service. The main switchboard for power and lighting service has 10 panels of lighting service (75 circuits and 340 outlets), 1 motor distributing panel, 11 motor starting panels aggregating 90 h.p. in two phase motors, and 2 special outlets for stereopticon and moving picture machines. The entire electrical clock system has 23 secondary clocks, 1 master clock, and programme movements, operating 23 recitation bells 3 inch, light 6 inch corridor gongs, four 10 inch special inside gongs, and four 12 inch outside weatherproof gongs complete with rectifier, charging set, and duplicate cells of 22 volts. There will also be installed a central station phone system with 24 outlying phones operating from storage batteries, and a complete fire alarm system with 8 factory horns and 8 break glass stations operating through a master station and relay. This contract, amounting to $7,000, has been awarded to The Griffing-Scofield Electric Co., 46 New Church street, Hartford, Conn.

The Harbor Electric Co., Harbor Beach, Mich., has secured the contract for wiring Our Lady of Lake Huron Catholic church, which is to be built there this summer. The wiring is to be conduit work in accordance with the regulations governing. Fixtures are not to be installed until late in the fall, and will be for indirect lighting.

The Beattie Electric Co., 324 East avenue, Cincinnati, Ohio, has the contract to wire the Duttenhofer power building at Sixth and Sycamore streets, Cincinnati. The wiring will be installed in conduit throughout the entire building, and will be especially installed to light work tables. Each floor will be supplied with floor boxes so as to feed the work table lights with a minimum of overhead wiring.

The electrical work in the Drexel State Bank building at Oakwood boulevard and Cottage Grove avenue, Chicago, is now being installed by the United Electrical Construction Co., 110 South Dearborn street, Chicago. The basement and first story are to be used for bank quarters, and the second and third floors as offices for physicians and dentists. In all the offices will be installed services of different kinds suitable to the requirements of the different tenants, each office having a number of electrical wall plugs, together with compressed air openings. The wiring is run with a separate circuit to each room, and the cutout panel is so designed that any circuit or combination of circuits can be metered without rearranging the wire. The building will be served by the Commonwealth Edison Co. with alternating single phase for lighting and 3-phase for power service. A number of motors will be installed for driving ventilating fans, house pumps, vacuum heating pump, vacuum cleaning apparatus, compressors, and other services. All the motors will be placed in one room. Taking advantage of this layout, the contractors have mounted all the controllers and starting apparatus of the various motors on one large 6-panel switchboard, thus giving a central control for all apparatus.

The Beck Electrical Construction Company, 1139 Plymouth Bldg., Minneapolis, Minn., is equipping a sixteen apartment building at Sixth and Summit streets, St. Paul, with a complete electric layout, including fixtures. White pipe and fittings will be installed throughout. Telephones have not been ordered but are under contemplation by the owner. This company is also equipping the forty-two apartment building at the corner of 19th street and First avenue, South, Minneapolis. This system is complete in every respect, including telephones, mail boxes, door locks, bells, and lighting equipment. Here instead of using the regular apartment house telephones, a P. B. X. will be installed in the basement and a girl left in charge at all times. The vestibule telephone will be one of the stations on the regular Northwestern telephone system, so that when a visitor calls, instead of getting this party, they will get the telephone girl, who will tell them whether the party is in or out.

Howard G. Ramsey, of Uxbridge, Mass., is at present installing the switchboards in the J. M. McCarthy department store at Woonsocket, R. I. The work is being done in sections so as not to interfere with the business of the store. The installation is a flexible steel armored job with Brascolite fixtures and nitrogen lamps. The windows are lighted by X-Ray reflectors. The outline lighting, in which there will be nearly 3,000 lamps, is to be in conduit, using condulet type K fittings. The third and last section of the work will probably be completed in July or August.

The present four story building owned by the Derr Estate at Wilkes-Barre, Pa., will be remodeled and two stories added. In addition to the lighting equipment, which will consist of approximately 200 outlets, there will be power service for two elevators. The contract for this electrical work has been given to Shepherd & Rust, 42 West Market street, Wilkes-Barre.

A four-story apartment house now going up in Saratoga avenue, Yonkers, N. Y., will be wired by the Youmans Electric Co., Inc., of 45 Main street, Yonkers. This is just an ordinary eight-family apartment, wired in B X cable with one circuit to an apartment. The meters are in the cellar and the service is brought in through a standpipe. In addition to the electric lighting, there are front and rear door bells, private hall door bells, door openers, and a conduit system providing for the installation by the telephone company of the necessary wiring for a telephone in each apartment.

GLEANINGS FROM THE N.E.L.A. QUESTION BOX

Reprinted from the Bulletin of the National Electric Light Association.

What do member companies consider the greatest obstacle at the present time in the path of electricity as applied to cooking?

D. K. Carpenter—The greatest obstacle at the present time is without a doubt the lack of appreciation of the possibilities in the use of electricity for cooking by the managers of central plants, consequently the almost complete ignorance of the customers.

George A. Hughes—The greatest obstacle is, in my judgment, the conservatism of many central station managers with reference to making a rate low enough to permit the general use of electric cooking devices. It has been proved beyond question or doubt that the electric range load is a profitable one from the central station point of view, even on as low a rate as 3 cents a kilowatt-hour.

In a town of 15,000, in this country, there are 850 electric ranges installed, with a connected stove load of approximately 3,500 kilowatts. The central station has been able to trace only 100 kilowatts of this load on the lines at one time, and this between the hours of eleven and twelve o'clock in the forenoon. This shows a diversity load-factor of 35 to 1. The chairman of the English central station organization, known as the "Point Five" Association stated in his annual address before the association in June last year, that his experience had shown the diversity load-factor of electric ranges to be 20 to 1. Based on the returns received in the city above referred to, where they make a rate of 3 cents a kilowatt-hour, and allowing for all possible mistakes, this gives the central station an income of $120 a kilowatt-year for cooking as against $30 a kilowatt-year for lighting. We believe that there is no proposition today that offers a more profitable load to the central station than electric stoves and ranges, and I am not basing this opinion entirely on my experience as a manufacturer of electric ranges, but upon my 20 years' experience as a central station manager.

Those who were engaged in the electrical industry at the time power motors were introduced, will recall the strong protest made by many central stations that they could not make a rate sufficiently low to permit the use of motors. Somehow the central stations which did offer such a rate made more money than before, and to-day a rate low enough to permit the use of electric motors is universal.

The objection urged, that the cost of electrical devices to customers is high, has some weight still, but when the fact is taken into consideration that up to four years ago the cheapest electric range on the market was $95 wholesale, and a range of similar capacity can be had to-day at $35, the tremendous strides the manufacturers have been taking in lowering the cost of appliances is clearly shown.

H. G. Overbeck—Varying local conditions will no doubt develop different obstacles. In our own community (population 2,000) the only obstacle we have been unable to overcome is the lack of economical means for supplying hot water. With the coal range hot water is practically a by-product. The circulation water heaters at present on the market consume an excessive amount of current in comparison with the by-product hot water of the coal range. Another objection, applying only to the winter months, arises from the fact that in small towns like this, many of the houses have no heating plants and depend to a considerable extent on the heat from the kitchen range to keep the house comfortable. Such objections as cost of the appliances, lack of familiarity with their use or fear of the current, can be overcome by education. All this, of course, applies to the larger appliances. The smaller appliances are coming into favor, at a rate entirely commensurate with our efforts to introduce them. We had considerable success this spring with an electrically heated cooker built on the fireless cooker principle and found it very popular because of the time-switch feature.

Will member companies kindly state the number of mazda lamps per capita sold during the last three years?

***Clarence L. Law*—The New York Edison Co. in the year 1911 sold 5 lamps per capita; in 1912, 5 lamps per capita; and in 1913, 8 lamps per capita.**

Where the company's lines are in the street in front how do member companies place service wires for customers who want their meters on the back porch and object to having the lines run around the house? Are contractors required to run wires through the house to the front? Is this not objectionable because of possible theft of current?

L. M. Klauber—Where the lack of alleys necessitates a service from the street and the customer desires the meter on the back porch, the contractor carries the wires through the house to the front, since our local ordinance states:

> All wires from service switch to outside of building ready for connection by the service company, shall be installed by the person, firm or corporation doing the interior wiring. All entrance wires shall be run from that point of a building nearest the service company's nearest pole, and further. In the case of buildings used as dwellings where it is desired to locate the service cutout (and meter) at a distance greater than three feet from the point of entrance of the entrance wires, such entrance wires shall be run in approved continuous iron conduit * * * and not over six feet of the total length of conduit shall be within the walls of the building, or in any manner concealed.

Prior to the passage of this ordinance many services were run "knob and tube" through the unfinished attics of one-story houses, yet we were not troubled by theft of current because of this practice.

Why does the voltage of a current transformer build up on open circuit?

W. R. Woodward—The secondary voltage of a current transformer will rise to whatever value is necessary to force the secondary current through its impedance load. On open circuit the impedance of the load is infinite and the voltage rises as high as possible.

Another way of considering this is that under normal operating conditions the primary ampere-turns (neglecting exciting current which is small) are counter-balanced by the secondary ampere-turns. On open circuit all the primary ampere-turns become exciting current and magnetize the iron to saturation. The primary winding is then simply a choke coil in the circuit.

What is the proper way to extinguish a fire in large station transformers? What preparations have companies made for fighting such a fire? Should an attempt be made to smother it or should the oil be drawn out when it is burning?

C. S. Van Dyke—In case of fires in large station transformers, the best method is to smother the fire if possible since it is impossible to get directly at it on account of not being able to take the transformer apart. In air-blast transformers this is best done by shutting off the air and using carbon tetrachloride extinguishers. In oil transformers, where the oil can be drained into a sewer so that it will not be exposed to the flames, the oil should be left in the transformers but not until it begins to boil over, as this would increase the liability of spreading the fire. By leaving the oil in the transformers up to the boiling point advantage is taken of the great thermo capacity of the oil and the dissipation of the heat of the fire. It would be an advantage if fresh cold oil could be substituted for the oil in the transformer if the temperature of the latter is near flashing point.

Is the use of slate as panels for 440-volt alternating current considered as good practice as marble, and how does the strength of the two materials compare?

Of what material and how thick should a switchboard panel be for 4000 or 6000-ampere carbon-break circuit-breakers for 440-volt alternating-current service.

W. T. Campbell—The use of slate panels for 440-volt alternating current is not considered the best practice when very heavy equipment is to be mounted. Slate, however, can be used for voltages as high as 1200 volts. It is common practice to mount such equipment as heavy carbon breakers on 2½-inch marble. One objection to slate is that it has a greater tendency than marble to chip and crack.

Because of the many conflicting claims made and the lack of authentic records advanced I shall be indebted to the "Question Box" for answers to the following questions.

(1) *In what country was the first electric railway of any description built, by whom, when and where.*

(2) *If France can establish her claim to precedence, who in this country was the first to construct and operate, when and where?*

(3) *Name the first of the commercial electric railways antedating the Richmond line and give references.*

G. A. Coe—The modern electric railway originated in Brandon, Vt., in 1835, when Thomas Davenport, a blacksmith, built an electric railway model in which the primary batteries used were carried in the locomotive. Next came Robert Davidson of Aberdeen, Scotland, who built a powerful electric locomotive which carried its primary batteries in the same way.

The first experimental railway was installed at Berlin in 1879 by Messrs. Siemens & Halske, operating on the third-rail system, and the first commercial line was opened in 1881 at Lichterfelde, Germany, also operating on the third-rail system. In 1883 a third-rail system was installed at Portrush, Ireland.

The first line to use the overhead trolley was the Henry line in Kansas City in 1884, which was an experimental line. On July 27, 1884, Bentley & Knight, in Cleveland, Ohio, opened the first slotted conduit road.

The line opened on August 10, 1885, between Baltimore and Hampden was the first commercial electric railway in America and was supplied by the overhead trolley wire system. Later in the same year a railway was opened in Toronto, Canada.

In 1886 Frank Sprague adopted the under-running trolley and perfected that system at St. Joseph, Mo., in the latter part of 1887 and Richmond, Wilmington, Philadelphia and New York in 1888.

According to Government statistics, there were in 1887, 20 electric railways in operation and 22 under construction in the States.

On December 18, 1890 the City and South London Subway was opened to the public and was the first underground electric railway.

Define the terms "reactance coil" and "choke coil" and state under what conditions the two are used.

Henry A. Cozzens, Jr.—A reactance coil is one which offers a high reactance to any surge so as to lower the frequency of oscillation, or any coil which utilizes the counter electromotive force of self-induction to cut down the flow of current in an alternating-current circuit. The terms reactor, reactance coil, choke coil, and kicking coil, while the principle is the same, are applied as the use may vary. As a rule, one speaks of reactors and reactance coils being placed in feeder circuits or in the leads of a generator, while the choke coil is generally associated with a lightning arrester. The term kicking coil is used to denote the heavy copper coils in direct-current feeders.

Will the member companies operating small plants and manufacturing ice as a by-product off peak load give their experience with such apparatus?

1—Approximate cost of installation.

2—Marketing of ice.

3—Approximate income realized.

W. S. Hays—1—The cost of installation will of course depend on the size of the steam plant and the capacity in tons of ice desired. Approximate figures would run $1,000 per ton of ice, daily output.

2—The most desirable market—few accounts, ready cash and steady profit—is selling by wholesale to local distributors and by car load to foreign trade, and the icing of refrigerating cars, if convenient to railroads. To retail ice requires almost an entirely new organization, the care of horses, wagons, and drivers, and the hundred-and-one griefs of any small retail business, many accounts and hundreds of people to deal with. If strictly a cash proposition the retail business can be handled and made possibly a little more profitable than the wholesale, but this would hardly justify the added burden. By cash, I mean the purchase of coupon books in advance or cash transient orders. Under the wholesale plan all that is needed beyond the regular plant organization is one day ice-puller, and a night-man during the peak season of two or three months.

I would recommend sufficient storage capacity to permit pulling the capacity of the plant steadily for the 100 days of the season. This 100-day run should be calculated to take care of the season's demand, with 25 per cent. to spare to care for normal increase in population and extra warm weather. Of course any amount above that would make it possible to sell ice outside of regular contracts during peak when almost any price can be got for it.

RECENT LEGAL DECISIONS

Of Special Interest to Electric Light and Power Stations

Projecting Spikes on Poles—Invitee or Licensee?

A telephone company maintained a pole in front of a dwelling house on which electric light poles were carried. Iron spikes projected from the pole, for use in ascending and descending. A kitten belonging to the children of the occupant of the dwelling house climbed the pole; the said occupant, to rescue the kitten, also climbed the pole by means of the spikes. While there he came in contact with defectively insulated wires and received a shock from the effects of which he died. In an action for his death it was held that the presence of the spikes was not an implied invitation to any person to climb the pole for a purpose in no way connected with the defendant's business. The deceased, therefore, was not an invitee, but, at most, a mere licensee, as to whom the defendant owed no duty, except not to wilfully expose him to risk of injury.

State v. Chesapeake & Potomac Telephone Co., Maryland Court of Appeals, 91 Atl. 149.

Invalid Franchise—Municipality Estopped to Deny Company's Rights

A municipality granted to an individual the right to use the streets for poles and wires to supply the city and the citizens with light. The contract was assignable and in 1898 it was assigned to a corporation which relying on the contract extended its lines and made large investments. Subsequently, by Acts 1898, c. 381, the municipality was authorized to issue bonds to raise money to erect a plant to supply the city with light and power. By Acts 1900, c. 75, provision was made for the establishment by the city of an electric plant for that purpose. Neither of these acts gave the municipality the exclusive right to furnish electric light and power to private consumers. The city sought to enjoin the company from erecting or replacing poles and wires in the streets and from furnishing electricity in the city. It was held that, though the first franchise was invalid, yet, the municipality having power under Acts 1898, c. 479, to consent to such use of the streets, was, after the company had expended large sums of money in the erection of poles, etc., estopped to deny the company's rights. Decree dismissing the bill was therefore affirmed.

Hagerstown v. Hagerstown Ry. Co., Maryland Court of Appeals, 91 Atl., 170.

Rate Fixing—Production of Books and Papers by Company

In a contest between a patron and a utility corporation in regard to the establishment of reasonable rates for the supply of electricity, it was held that the Idaho Utilities Commission had power to require the corporation to produce any and all records, contracts, or papers bearing upon the question in issue and that would throw any light upon the question of reasonable rates. The Commission has full power and authority to pass upon and determine the relevancy or competency of all evidence offered to prove or disprove the issues made by the pleadings, and this authority should be liberally exercised to enable parties to prepare properly for trial.

The business of the Washington Water Power Company, the defendant, in the original proceeding, is the manufacture and sale of electricity to numerous customers, and it was held that the reasonable cost thereof could only be determined by showing the actual value of the plant, the actual cost to manufacture and deliver the electricity, and all necessary disbursements for that purpose, including taxes, also the depreciation of the plant, plus a fair return on the money invested. To determine the questions that must be determined, it would necessitate an examination of the plant and business of the corporation, and for that reason the plaintiff, in order to prepare itself for trial, should have an inspection of all the books, papers and documents of the corporation and all of its plants, in so far as the same would show, or tend to show, the reasonable value of the plant and what it actually cost to manufacture and deliver electricity and power.

Federal Mining & Smelting Co. v. Public Utilities Commission, Idaho Supreme Court, 143 Pac. 1173.

Guy Wires in Highways—Burden of Proof

In an action for personal injuries caused by the plaintiff's wagon striking a guy wire alleged to be so attached to one of the defendant's telephone poles as to constitute a dangerous obstruction to travel upon a public road, it was held that the burden was upon the plaintiff to show that the guy wire was within the road limits. In the present case the evidence was held not sufficient to warrant the jury in finding that the guy wire was within the road limits as originally established or as broadened by prescription. While a highway may be established or broadened by prescription, the rights of the public therein are limited to the land used prescriptively, and a telephone guy wire two feet outside the traveled way cannot be upon a prescriptive highway. A verdict was held properly directed for the defendant.

Shackford v. New England Telephone & Telegraph Co., Maine Supreme Court, 91 Atl. 931.

Use of Streets for Poles—Rights of Abutting Owners

New Jersey Township Act provides that a township committee may provide for lighting the streets and public places of the township, and may contract with any person or private corporation for a supply of light for public use in the township. It was held that the power to light the streets includes the power to use the prevailing and approved methods of lighting by electricity, and necessarily implies the right to employ the instruments required to effectuate the object of the grant; and when the privilege thus granted is exercised through the medium of another, as authorized, the right is automatically transferred to that other, including the right to erect poles and wires in the streets for public lighting without the consent of the abutting owners. But an electric light company having a franchise to light the streets of a township and to construct poles and wires in the streets for that purpose erected poles in the streets much larger and higher than was necessary for that purpose in order to carry a high-tension transmission system intended for the sale of electricity to private consumers. In an action by an abutting owner, it was held that the construction of such poles without the consent of abutting owners was unlawful and subject to injunction.

Thropp v. Public Service Electric Co., New Jersey Court of Chancery, 91 Atl. 318; Dolton v. Public Service Electric Co., 91 Atl. 589.

Uninsulated Wires—Injuries to Employees

Action was brought by an employee for injuries received while helping to move a cement mixer operated by electricity by his foot coming in contact with an uninsulated part of the wire which carried the electric current to the machine. There was evidence to show that the plaintiff was ordered by his foreman to be where he was when injured, and that the employer knew that the place where the injury occurred was one where it could reasonably expect its employees to be. It was held that this made out a prima facie case for the plaintiff. The employer was held bound to exercise the highest degree of care and foresight to have and keep its wires, charged with a current of electricity dangerous to human life or safety if exposed, so insulated or guarded as to prevent injury to persons in its employ by contact therewith while in the performance of their duties.

Campbell v. Springfield Traction Co. (Mo.), 163 S. W. 287.

Acquisition of Right of Way for Telephone Line by Electric Light Company

An objection that a corporation seeking to condemn land for a right of way, is a subsidiary one, acting in combination with other similar corporations in pursuit of an unlawful conspiracy in restraint of trade, is a collateral attack on the legality of the existence of the corporation and is not permissible in a condemnation proceeding.

A statute authorizing corporations organized to manufacture and sell electricity for heating, lighting, and power, to condemn lands to enable them to fulfill the objects of their organization, for buildings, structures, dams, and lines of poles and wires, authorizes an electric light and power company to condemn a right of way for a telephone line for its own use as incidental to the discharge of its public duties in the operation of its high-voltage electric transmission line.

Joliff v. Muncie Electric Light Co., Indiana Supreme Court, 105 N. E. 234.

Uninsulated Wires—Where Negligence for Jury—Cost of Insulating no Defense

The owner of a tree, the branches of which extended over the land of another, was required by a Massachusetts statute, to remove moth nests from the tree and its overhanging branches. A person, acting under orders of the owner of the tree, extended his appliance for the removal of such nests over the land of the adjoining proprietor to reach the overhanging branches. In so doing he received a shock of electricity from the uninsulated power wire of an electric company which was on the land of the adjoining proprietor, and was killed. In an action against the electric company for his death, it was held that the deceased was not a trespasser, and therefore the defendant's liability could not be determined on the theory that the deceased's act was wrongful. Evidence of the defendant's negligence in maintaining the wire without insulation and of the deceased's freedom from contributory negligence was held sufficient to go to the jury. It was held to be no defense that similar wires carrying similar currents were not insulated elsewhere, or that the cost of insulation would increase the cost of transmission of power.

Philbin v. Marlborough Electric Co., Massachusetts Supreme Court, 105 N. E. 893.

Change of Grade—Cost of Relocation of Conduits

It is held that where a municipality grants to a telephone company the right to lay its conduits under its streets, the grant is subject to such reasonable regulations as the municipality may properly make under its police power. If a city changes the grade of one of its streets, in the interest of public safety, so as to elevate the tracks of a railroad company under an agreement with the latter, and in consequence a telephone company is compelled to relocate certain of its conduits under the street, the telephone company cannot recover either from the city or the railroad company the cost of such relocation.

Keystone Telephone Co. v. Philadelphia & R. R. Co., 56 Pennsylvania Superior Court, 384.

Dangerous Work

Action was brought for personal injuries received by the plaintiff while engaged in insulating certain electric wires at the defendant's electric power plant. The plaintiff was a boy 18 years of age, without training or experience. His hands were seriously injured by contact with a high-voltage wire. The action was founded on the Oregon Employers' Liability Act of 1911. That act requires all persons engaged in the manufacture and transmission of electricity of a dangerous voltage to provide full and complete insulation at all points where employees are liable to come in contact with the wire; that dead wires shall not be mingled with live wires, nor strung upon the same support; that the arms or supports bearing live wires shall be specially designated by a color or other designation; that live electrical wires carrying a dangerous voltage shall be strung at such distance from the poles or supports as to permit repairmen to engage freely in their work without danger of shock; and that the manager, superintendent, foreman, or other person in charge or control of the construction or works, or operation, or any part thereof, shall be held to be the agent of the employer in all suits for damages for death or injury to an employee. There was evidence that the boy was placed under an electrician who was employed on the line, and permitted by him to ascend the poles and engage in tying high-voltage wires there. It was held that the electrician was the agent of the employer under the statute, and that the evidence was sufficient to justify the submission to the jury of the defendant's negligence in permitting the plaintiff to engage in such hazardous employment.

Betts v. Bisher, C. C. A., 213 Fed. 581.

PUBLIC SERVICE COMMISSION RULINGS

Authorized Sale of Plant

The Pacific Railway Company has been authorized to transfer to the Southern California Edison Company the portion of its heating and lighting system serving Playa del Rey, it having been shown that the latter company was in a better position to serve the consumers satisfactorily and that it would rebuild the system and make it of standard construction and offer better rates to consumers.—*California Commission.*

Free Service to Municipality—Discontinuance

In re Abingdon Home Tel. Co. the commission holds that where any public utility doing business in the State is required by the terms of any franchise ordinance, granted to it by a municipality to furnish service to such municipality in consideration of its franchise, such public utility shall observe such franchise requirement until otherwise ordered by the commission. The commission reserves the right to inquire into the reasonableness and sufficiency of any such franchise requirement and to disregard the same whenever the rates and charges of any such public utility shall be hereafter considered and determined by the commission. Under these rulings it was held, after consideration of the case, that a telephone company which had been furnishing free telephones to the city in compliance with a franchise provision might discontinue such service.—*Illinois Commission.*

Discrimination—Stockholders and Consumers Owning Equipment

Decisions by this commission provide that a stockholder cannot be given any greater or less or different rate than the rate charged other subscribers, and that it is unlawful to grant any reduction from the regular rate on account of subscribers owning their own telephones. It is held that an increase in telephone rates will be allowed, to eliminate such discrimination. In re Tampico Farmers Mut. Tel. Co.—*Illinois Commission.*

Increase in Rates—Consent of Consumers

A natural gas company filed an application for authority to increase its rates, on the ground that its revenues were no longer sufficient to yield a fair return upon the value of the property employed in carrying on its business. The mayor and common council and citizens' committees of the cities affected joined in the request. The application was granted. In re Indiana Gaslight Co.—*Indiana Commission.*

Public Utilities Act and Government Commission Act Not Inconsistent

The Kansas Supreme Court holds that the public utilities act does not in terms amend or repeal the commission government act. There is no inconsistency between the two, and hence no basis upon which to rest an implied repeal. On the other hand the clear indications are that the public utilities act was designed to be cumulative and supplemental to the earlier one. Under the commission government act electors, who need not be taxpayers, have 10 days after the passage of an ordinance in which to protest against it, and in this way to require a reconsideration of the ordinance by the board of commissioners, and if it be not entirely repealed, to require its submission to a vote of the people for acceptance or rejection. Such a protest raises the question whether or not there shall be an ordinance at all. If, however, no protest be filed within 10 days, taxpayers have 5 days more, or 15 days from the passage of the ordinance, in which to complain to the Public Utilities Commission and thereby secure changes in particular features, or, in case of utter illegality, unreasonableness or antagonism to the public welfare, to have the entire ordinance set aside. There being no uncertainty in the language employed, no conflict or contradiction in terms, no resulting incongruity or absurdity, and no resulting evil or injustice, the conclusion must be that the legislature intended both acts to stand as the expression of its will. It was therefore held that an ordinance for electric light, which upon protest duly made was not repealed, and a submission to a vote did not receive the approval of a majority of the electors, did not become operative. Humphrey v. Board of Comrs. of Pratt 144 Pac. 197.—*Kansas Commission.*

Necessity of Certificate From Commission

Section 31 of the Kansas public utilities act provides that no public utility shall transact business until it shall have obtained a certificate from the Public Utilities Commission that the public convenience will be promoted. The Kansas Supreme Court holds that this section does not apply to a public utility, such as an electric light plant, owned and operated by a municipality.—*Kansas Commission.*

Price of Electricity Sold

Complaint was made regarding the price of electricity sold by the Milford Electric Light and Power Company, which supplies electricity in Milford and Hopedale, Mass. Its prices for commercial lighting were 20 cents a kilowatt hour for the first 15 kilowatt hours used a month, and 12 cents in excess of 15 kilowatt hours, with a discount of 2 cents a kilowatt hour for prompt payment. For power it charged 6 cents a kilowatt hour, with a discount of 1 cent for prompt payment. Several customers were given special rates, some at 10 cents a kilowatt hour and some at prices based on lamps installed.

As to the special rates, the commission without dealing with the matter, merely recommended that they should be discontinued, and what was offered to any one customer should be open to all who sought the company's service under like conditions. It recommended that the maximum net price for electricity supplied for any use should not exceed 14 cents a kilowatt hour.

and that the price to the town of Milford for the alternating current 6.6 ampere enclosed arc street lamps be not more than $90, and for the 40-watt tungsten incandescent street lamps be not more than $18 a year instead of $105 and $24, as formerly.—*Massachusetts Commission.*

Combined Gas and Electric Business—Separation of Plants

In recommending as the maximum net price for gas charged by the Lawrence Company a price not exceeding 85 cents per 1000 cubic feet the board said:

"In a combined gas and electric business it is not easy to keep the respective plants and operations accurately separated. The investment to some extent, at least, represents joint needs, and many of the general expenses are common to both departments, and must be arbitrarily apportioned, if at all. It is important that the consumers of gas shall not be required to assume in the price charged any of the cost properly belonging to consumers of electricity. The latter have an equal and opposing right. There is evidence in the company's accounts that the electric business has been relatively more profitable than its gas business, and the board has been influenced in the conclusion which it has reached by a purpose to give due weight to this consideration."

It also said that if a differential price to its office employees was justified on any ground, and particularly as a feature of their agreed compensation, the practice was so obviously susceptible of abuse that, as a rule, it is expedient that the employees of public service corporations should be on the same footing as to prices for gas or electricity purchased.—*Massachusetts Commission.*

Consolidation of Electric Companies

The Massachusetts Board of Gas and Electric Light Commissioners have approved of the consolidation of the Turners Falls Power and Electric Company and the Turners Falls Company, and of the issue by the former company of 25,000 shares of additional capital stock of the par value of $100 each, and of its exchange for the entire capital stock of the Turners Falls Company.—*Massachusetts Commission.*

Issue of Stock to Retire Notes

The Massachusetts Commission has approved the issue by the United Electric Light Co. of Springfield of 2,500 shares of new capital stock at $185 per share to take up an equal amount of promissory notes outstanding on a specified date, it appearing that the net (uncapitalized) expenditures for additions to plant prior to such specified date exceeded the amount which would be realized from the sale of such stock.—*Massachusetts Commission.*

Issue of Bonds

The Canton Electric Company has been authorized to issue $115,000 first and refunding mortgage 5 per cent. sinking fund gold bonds, and to sell them at not less than 85 per cent. of the par value, plus accrued interest, for the purpose of reimbursing its income account for money actually expended therefrom for extensions, improvements and betterments.—*Ohio Commission.*

Competing Companies—Powers of Commission

The Public Utilities Commission of Ohio holds that, under the statute, it has no power to refuse authority to a light and power company to issue its stocks and bonds on the ground that there is a like utility already occupying or operating in any municipality or locality, furnishing adequate like service or commodity as that proposed by the applying company. The commission said that it was not bound and therefore refrained, at this time, from expressing the wisdom of the legislature in not vesting such a power in the commission, but merely looked to its enumerated statutory powers relative to such matters. In re Mahoning County Light Co. —*Ohio Commission.*

Reasonableness of Rates

In dismissing a petition for the reduction of gas rates the Oklahoma Commission holds that, regardless of whether the rates produce a sufficient revenue to pay an income on investment, they may be unreasonable. When a plant is not making a sufficient revenue to pay depreciation and interest on the investment, it should be permitted to charge any reasonable rate that will produce the greatest net revenue. El Reno v. El Reno Gas & Electric Co.—*Oklahoma Commission.*

Rates for Domestic Heating Appliances

An electric company maintained certain flat rates for business and residence lighting contained in schedules A and B, and provided certain meter rates for business or residence lighting (optional) in schedule C. Schedule D contained meter rates for power, for an unlimited use, and schedule E meter rates for power not to be used on the peak of the company's service. Schedule C rates were as follows:

First 20 kilowatt hours per month at 15 cents per kilowatt hour.

Next 10 kilowatt hours per month at 10 cents per kilowatt hour.

Next 70 kilowatt hours per month at 7½ cents per kilowatt hour.

All in excess of 100 kilowatt hours per month 5 cents per kilowatt hour.

Minimum charge, $1 per month.

Schedule D and E rates were based upon the maximum demand of the consumer with a minimum charge of $1 per month per kilowatt of maximum demand, but no minimum charge was considered less than $2 per month. The rates stated in schedule D and E varied in proportion to the time that the maximum demand of the consumer was used.

It was the practice of the company in cases where small motors and domestic heating appliances were used on the premises of consumers using its product under schedule C for lighting purposes, to insist upon schedule D or schedule E being applied for current consumed by such small motors and appliances. In proceedings for the amendment of rates it was held that the resulting rate for domestic heating appliances and small motors (not exceeding two kilowatts total connected load) was unjust and unreasonable. It is customary, and a reasonable practice, to permit consumers under business or residence lighting schedule to install domestic heating appliances and small motors, not exceeding two kilowatts total connected load, as a part of their regular installation, and without requiring a separate motor and monthly minimum therefor. In so far as the company's practice did not permit this to be done, it was held to be unjust and unreasonable. The company was therefore ordered to amend its existing schedule C by adding the following:

"Domestic heating appliances and small motors not exceeding two kilowatt total connected load may be used as a part of the consumer's installation on his regular lighting meter at the above rate."—Hubbard Creamery Co. v. Molalla Electric Co.—*Oregon Commission.*

MANUFACTURERS' NEWS

A company to manufacture molded insulation has just been established at Watertown, Conn. It is called the Watertown Mfg. Co. C. B. Buckingham is president and treasurer, R. C. Vaughn is secretary, and T. F. Butterfield is superintendent.

The Automatic Electric Washer Co., of Newton, Iowa, announces that H. M. Vaughan has been appointed to the position of sales and advertising manager of the company.

The A-A Electric Mfg. Co., 355 Water street, Bridgeport, Conn., has bought the street fixture and store lighting business formerly conducted by Harvey Hubbell, Inc. Prices and policy will remain the same as formerly.

On May 1 the U. S. Auto Battery Co. removed from 60-62 Warren street to Room 42, Gerken Building, 90 West Broadway, New York.

On May 1, the Main Electric Mfg. Co., Inc., removed from its old quarters at 215-221 South Beatty street to 500-516 Aiken avenue, Pittsburgh, Pa., on the main line of the P. R. R. At the new address the company has a private siding and three times the space it had at the old address. Increase of business is the cause of this change to larger quarters.

The Standard Paint Co. has removed its general offices from 100 William street, New York, to larger quarters in the Woolworth Building, Broadway and Barclay street.

The American Ever Ready Works has removed from 304 Hudson street, New York, to Long Island City, N. Y.

The Century Electric Co., 19th, Pine and Olive streets, St. Louis, Mo., has increased its capital stock, fully paid, to $1,000,000 to enable it to take care of the increasing demand for Century motors and fans.

Telephone communication between the advance or rescue party and the outside of the mine, in the case of mine accidents, is one of the features of the daily demonstration of the U. S. Bureau of Mines rescue crew conducted in connection with the exhibit of the Bureau at the Panama-Pacific Exposition at San Francisco. One of the features of this exhibit is the daily rescue drill by a crew of four or five men. Twice a day, in response to a telephone message to the effect that an explosion has occurred in a mine, the crew puts on oxygen helmet breathing apparatus and Western Electric mine rescue telephone apparatus, goes into a glass-walled room located on the main floor of the Palace of Mines and Minerals, and demonstrates that it can actually breathe and work in the midst of smoke and poisonous gases. Then they go below into the "mine" and bring out a supposedly injured miner to whom they administer "first aid" treatment. All the time the rescue crew is in the smoke-filled room and in the mine, they are in touch with the outside by means of the telephone equipment.

The Peerless Light Co., Halsted, Adams and Green streets, Chicago, Ill., announces that owing to recent advances in the price of all white glassware they have decided to discontinue the handling of this type of glass. The large stock of staple designs now on hand will be cleared out at reduced prices.

The Dale Lighting Fixture Co., 107 West 13th street, New York, recently received an order for 13,000 lighting fixtures for the new Equitable Building, in New York. A new unit, called the "Broadway" unit, has been designed for this purpose. It is so designed that with the necessary attachments it can be made into a direct-lighting, indirect-lighting, or semi-indirect-lighting unit.

The Chicago & Milwaukee Electric Railroad Co. has placed an order with the Westinghouse Electric & Mfg. Co. for fifteen quadruple equipments of type No. 557-A, 140-h.p. motors with double end type "HLF" control. These equipments are to be placed in high speed passenger express service between Chicago and Milwaukee. The cars will be arranged for train operation.

The W. B. Brown Co., Bluffton, Ind., uses over half a million feet of lumber of all kinds every year. Half of this quantity is used in making stand and floor lamps, the balance in chandeliers, domes and showers. The bulk of this wood consists of oak, mahogany, walnut, poplar, and birdseye maple. The staple wood used for this purpose is oak; mahogany comes next.

The Ashland Elec. Co., for a number of years located on Milwaukee avenue, Chicago, Ill., has moved to its new three-story and basement building at 1517 Haddan avenue. The entire building will be devoted exclusively to the manufacturing of sheet steel cabinets. The company has added two salesmen to its force.

The Illinois Traction System has placed an order with the Westinghouse Electric & Mfg. Co. for nineteen type U graphic voltmeters, twenty portable standard watthour meters, nineteen portable voltmeters, together with a number of other miscellaneous portable instruments of the laboratory type. The Southern Illinois Light & Power Co., Hillsborough, Ill., has also ordered eight portable graphic voltmeters and two ammeters of the same type, four portable wattmeters, two portable voltmeters and ammeters, two portable current transformers, and two each of the switchboard type graphic voltmeters and voltmeters, together with a varied assortment of other types of laboratory instruments.

The East Ohio Gas Co. recently placed an order with The Bruce-Macbeth Engine Co. of Cleveland, for two 250-h.p. and one 90-h.p. gas engines, all direct connected to generators for use in their new office and exhibition building now being erected.

The Dielectric Co. of America, Belleville, N. J., makers of weatherproof line wire, copper and copper clad, has just brought out a handy perpetual calendar in the form of a combination paper weight and paper clip. It can be turned to both uses at the same time, part of the paper being held in the clip while the others are kept in place by the weight. In addition to this dual use, it contains a perpetual calendar in red and black block letters on heavy cardboard, a glass window protecting the cards from dust and injury. The calendar can easily be kept in continuous service by shifting the cards monthly. This calendar makes a handsome desk ornament.

A big desk telephone, fifteen times the size of the familiar instrument of everyday use, is the central figure of the Western Electric exhibit at the Panama-Pacific International Exposition.

"Lighting Fixtures No. 21" is the title of 272 page, 10 x 13 inch catalogue recently issued by R. Williamson & Co., Washington and Jefferson streets, Chicago, Ill. It is copiously illustrated with excellent half-tone cuts. Divided into sections, this catalogue contains pictures and descriptive data of the different styles of fixtures made by this firm. The sections are seven in number, as follows: Elaborate Metal Designs, English Section, Colonial and Commercial, Combination Fixtures, Varialux Section, Compodura Section, Special Section.

The feed-water meter is a sort of cash register for the coal pile, since it keeps a record of the returns in amount of water evaporated for the expenditure for fuel. When the evaporation is low, the owner or operator will naturally look for the cause, as in inferior or unsuitable fuel, defective grates, leaky boiler settings, broken down baffles, soot and scale on the tubes, improper methods of firing, insufficient or improperly handled draft. As these conditions are improved one by one, the feed-water meter records the simultaneous improvement in evaporation, establishing a standard which acts as a constant stimulus and incentive to effort on the part of the boiler-room force. These facts are set forth in detail in a leaflet on "Testing V-Notch Meters," issued by the Harrison Safety Boiler Works of Philadelphia, Pa.

An attractive counter display card in the form of their trade mark shield, has been brought out by the Anglo-American Co. of Pittsburgh, Pa., to display its line of high grade flashlights. The shield is 14½ x 15 inches in size and is printed in three colors on heavy cardboard. The flashlights are attached by elastic cord, making it easy to remove or replace the samples.

General Electric Company reports a decrease of more than $16,000,000 in sales in the year ended December 31 last, but net profits amounted to $11,287,827, a decrease of only $2,201,530.

BRANCH OFFICES AND AGENCIES

Do you want an agent. If so, we will put the notice here free. The same privilege is extended to agents desiring to represent manufacturers.

On page 186 our readers will find an advertising section, giving the local address and telephone number of manufacturers' agents and branch offices of out of town concerns. The constant inquiries coming to the Electrical Record for this information caused this section to be started. It will be found especially useful by persons wanting immediate information. As a time saver it will be appreciated.

The Sterling Corporation, operating the Longoria Electrical Laboratories, 1276 West 3rd street, Cleveland, Ohio, is looking for a few more district managers for its remaining open territory. This company states that its field force is fairly well organized but that it can use a few more men of the right sort. It makes a specialty of equipment for hospitals and laboratories.

The American Electrical Equipment Co., 304 East 10th street, Kansas City, Mo., is looking for agents in all parts of the country to take hold of and push the sale of its recently marketed "Bed Lite."

A successful salesman who has traveled for years in China, Japan, India, and Australia, will start about the middle of June for a two years' trip. He is already financed, his salary and expenses being provided for. He wishes to take along a line of first-class electrical novelties so he can introduce them into the above mentioned countries. He now represents one of the leading mercantile houses in America. Inquiries concerning this opportunity for representation on this trip should be addressed to this office, Box 842.

A. G. Walin & Co., 4510 Whitman avenue, Seattle, Wash., solicit a few lines of electrical and automobile goods to sell to the trade, also lighting fixture specialties and novelties. This company is well acquainted with the electrical trade on the Pacific Coast.

The Satterlee Electric Co., 9th and Walnut streets, Kansas City, Mo., wishes to act as agents in that territory for manufacturers of electrical supplies.

R. W. Bennet, manufacturers' agent at 1213 Pine street, St. Louis, Mo., is open for a line of miniature lamps and novelties.

J. E. Calloway, 1026 Fourteenth street, Denver, Colo., would like to hear from manufacturers requiring a sales agent in that territory. He is especially interested in wiring supplies, specialties, and electrical novelties. He has been in the electrical business for 18 years and is well acquainted in that territory. He has had experience with two of the largest jobbers in Denver, also with a retail firm.

The Marion Insulated Wire & Rubber Co., Marion, Ind., is now located in its new quarters in Machinery Hall, 541-557 West Washington boulevard, Chicago, Ill. Walter C. Rardin has charge of this branch. A complete line of wires, cables and cords will be carried in stock for immediate delivery to Chicago customers, and for shipments adjacent to this territory. The office and warerooms are within a block of the freight terminals of several of the leading trunk roads.

The Hart Mfg. Co., of Hartford, Conn., has removed its New York office from 203 Broadway, New York, to Room 1034, 30 Church street, in the Hudson Terminal Building. The telephone number remains the same as before—"Cortlandt 487." Frank E. Watts is district manager of this company.

The Wagner Electric M'fg. Co., of St. Louis, announces a change in address of its Minneapolis office, from 1040 Security Bank Building to 307 Security Building.

Shapiro & Aronson, manufacturers of gas and electric fixtures at 20 Warren street, New York, have arranged with W. J. Justice, of Birmingham, Ala., to represent them in the South and Southwest. This concern has also opened a showroom in the Building Material Exhibit, Insurance Exchange Building, Jackson boulevard and Fifth avenue, Chicago, with J. J. Kidd in charge.

The Dongan Electric Mfg. Co., 745-747 Franklin street, Detroit, Mich., has established the following new agencies: T. Weiss, 280 West Water street, Milwaukee, Wis.; Roper-Clarke & Co., Montreal, Quebec; Houston & Co., Winnipeg, Manitoba; Houston, Tallman & Co., Regina, Saskatchewan; Houston, Carter & Co., Edmonton, Alberta.

The Chicago Mica Co., of Valparaiso, Ind., has opened a branch office in the Hodges Building, Detroit, Mich. A. W. Drew will be sales agent for that territory and have charge of this office.

The Oshkosh Manufacturing Co., Oshkosh, Wis., has appointed the H. B. Squires Company of San Francisco, Los Angeles, and Portland as its representative on the Pacific Coast.

The Despatch Mfg. Co., of Minneapolis, Minn., has entered into an arrangement with G. H. Otto, late of the Commonwealth Edison Co., to represent its line of electric ovens and electric heating appliances in Chicago, Ill. Mr. Otto's headquarters are at 72 West Adams street.

The General Insulate Co., 1001 Atlantic avenue, Brooklyn, N. Y., has appointed A. F. Larrabee, 88 E. Congress street, Detroit, agent for its Michigan territory.

Joel Martin, formerly Atlanta manager of the Banner Electric Division of General Electric Co., has joined the staff of the Walpole Tire & Rubber Co., of Walpole, Mass. He will look after the sale of Walpole tapes and insulating varnishes in the South.

The sale of Nuttall gears, pinions, and trolleys, manufactured by the R. D. Nuttall Company, Pittsburgh, for the electric railway, mining and industrial fields in the Chicago territory has been transferred to the Westinghouse Electric & Mfg. Co., 39 So. La Salle street, Chicago, Ill. The Chicago territory includes the southwestern corner of Michigan, northern halves of Indiana and Illinois, all of Wisconsin, Iowa, Minnesota, North Dakota, South Dakota, Nebraska, and upper peninsula of Michigan.

The Eclipse Electric Novelty Co., of 82 Duane street, New York, desires to offer the services of their sales department, in representing a manufacturer, in the states of New York, New Jersey, and Pennsylvania.

The Southern Electric Co., 1100 Pine street, St. Louis, Mo., has recently been appointed distributors for the Best Electric Co.'s products in the Southwest.

The United States Glass Co., South Ninth and Bingham streets, Pittsburgh, Pa., has appointed Fred. H. Scarborough as manager of sales of its illuminating glassware department for southern New Jersey, Pennsylvania east of Pittsburgh, Delaware, Maryland, District of Columbia, and Virginia. Mr. Scarborough will make his headquarters in the Philadelphia office of the United States Glass Co. in the Denckla Building.

The Adams-Bagnall Electric Co., of Cleveland, Ohio, announces the opening of a sales office at 1430 Park Building, Pittsburgh, Pa. This office will be in charge of M. F. Knapp, who has had six years' experience as city salesman for the General Electric Co., in Pittsburgh, and has, for the past year, been connected with the National Metal Molding Co.

The Metropolitan Electric Mfg. Co., Boulevard and 14th street, Long Island City, New York, maker of switchboards and electrical specialties, has appointed William Taylor its Western sales agent, with headquarters in The Rookery, Chicago. Mr. Taylor was formerly a manufacturers' agent at 203 Broadway, New York, having been in business there from 1896 to 1915.

James G. Biddle, who represents the measuring instrument department of Siemens & Halske, of Berlin, at 90 West street, New York, wishes to notify the trade that the war has not interfered in any way with the supply of Siemens & Halske instruments. He has an ample stock of them on hand at that place, a stock that can readily be replenished at any time.

The Standard Electric Novelty Co., 10 North Desplaines street, Chicago, Ill., is looking for agents to handle its electric novelties.

JOBBERS AND DEALERS

The Baker-Joslyn Co., Inc., has opened offices and warehouse at 71 New Montgomery street, San Francisco. This company will act as distributors of electrical material through the trade. This company has taken over the electrical lines of The Maydwell Co., Sheldon Building, San Francisco, which has withdrawn from the electrical field. The officers of the new company will be as follows: president, M. L. Joslyn; vice-president and treasurer, C. G. A. Baker; secretary, H. F. Hartzell. Mr. Joslyn is president of the Joslyn

Mfg. & Supply Co., of Chicago. Mr. Baker has been associated for many years with The Maydwell Co. as vice-president, and has been actively in charge of the electrical branches of their business. He will be in full management of the business operations of the Baker-Joslyn Company. Mr. Hartzell has been on the sales force of The Maydwell Co. for the past two years, and will occupy the same position in the sales department that he formerly held in The Maydwell Co. Branches of this company will be maintained at Seattle and Los Angeles.

The Funsten Electric Co., 1113 Wyandotte street, Kansas City, Mo., electrical jobber, has opened up an automobile accessory department. Manufacturers of such devices are requested to send them circulars and price lists.

The officers and directors of Sibley-Pitman Electric Corporation, which has within the past few days taken over the business and assets of Clarence C. Sibley and George D. Pitman, composing the firm of Sibley & Pitman of New York, are as follows: board of directors: Clarence C. Sibley, William M. Deming, Hugh Q. Foreman, E. B. Latham, George D. Pitman. E. B. Latham is chairman of the board. The officers are: president, Clarence C. Sibley; vice-president, George D. Pitman; secretary and treasurer, Hugh Q. Foreman. The office and salesroom of the new corporation will be at No. 19 West 36th street, New York, where the firm of Sibley & Pitman has been located for several years past.

Max Perwein, jobber of fixture parts at 375 Minnesota street, St. Paul, Minn., is about to remove to larger quarters at 41 West Fourth street, St. Paul. He has just issued Catalogue No. 1 containing 22 pages of illustrations of fixture parts carried in stock.

Feldman Bros., 215 Grand street, New York, are enlarging and extending their lines of electrical fixture parts and fittings. They are also carrying a line of electrical supplies.

Electrical dealers are showing interest in the prize fan window contest which is being conducted by the Western Electric Co. For the past three years this company has been actively helping dealers utilize their window space. One dealer is preparing a miniature Atlantic City boardwalk to run along the front of the window, upon which will move an endless belt carrying miniature dolls, roller chairs, and settees. Another dealer is rigging up a lighthouse on the rocks, using a winker socket to give the resemblance of a flashing light. Still another has made an endless belt arrangement to which he intends to attach small lifeboats that will go bouncing along back of the wave cutout.

PERSONAL

At the recent meeting of the St. Louis Electrical Contractors' Association, Chas. J. Sutter was elected president. He has been identified with the State and National associations for many years. He is a well-known electrical contractor of St. Louis.

Edwin G. Hatch has resigned as treasurer and manager of the Clark Electric & Mfg. Co., of New York.

R. M. Klein, who has been for some years sales manager of the Diehl Mfg. Co., Elizabeth, N. J., has resigned. On his return from a Pacific Coast trip Mr. Klein will take up new work in an executive capacity with an enterprise in which he is interested.

H. S. Wynkoop, who has been associated with the Department of Water Supply, Gas and Electricity in New York City for a number of years, has been elected president of the National Association of Electrical Inspectors.

OBITUARY

George Cutter died of heart failure April 6, at the California Hospital, Los Angeles, Cal., where he had been confined for six weeks. Mr. Cutter was vice-president of the George Cutter Co., of South Bend, Ind. He was born near Boston in 1853.

ASSOCIATIONS AND SOCIETIES

Arthur Williams, general inspector of the New York Edison Co., spoke on "It Pays to Advertise," at the luncheon of the New York Jovian Electrical League on April 7:

> The annual advertising bill of the country, he said, is twice the income of all the central light and power stations in the United States. It is about $700,000,000. It is two times that of any other country. To a certain extent that explains the wonderful prosperity and material development of the United States in the last decade. The electric light industry falls far short of the position it should hold in the field of publicity. I want to stir up the industry to a greater use of the advertising media at its disposal, individually and collectively. Every business house should set aside a definite percentage of its income for publicity. It may be a small percentage at first, but it should be a definite and growing one.

The New York Jovian League is celebrating the passing, by a vote of 124 to 4 in the Assembly, of the Master Electricians' bill.

The ninth annual convention of the Illuminating Engineering Society will be held at the New Willard Hotel, Washington, D. C., September 20-23, inclusive. E. S. Marlow, of the Potomac Electric Power Co., Washington, D. C., is chairman of the convention committee. The schedule of sessions and papers will be announced later.

A meeting of the Council of the Illuminating Engineering Society was held April 8, 1915, in the general offices of the Society, 29 West 39th street, New York, N. Y. The committee on lighting legislation reported that it had considered (1) a report containing material for formulating a code on factory lighting, which had been received from the committee on factory lighting, and (2) a report submitted by the committee on school lighting containing material upon which it is proposed to base a code on school lighting. The function of the committee on lighting legislation is to disseminate data and reports among legislative bodies, school boards, public service commissions, and other bodies or individuals who may or should be interested in enactments, rules, and regulations for better lighting.

"A highbrow is a man who understands everything but the obvious," said Elbert Hubbard at a recent meeting of the Buffalo Companies' Section of the National Electric Light Association.

An electrical club, designed to further the interests of all electricians in and about Springfield, Mass, was formed last month. It will be the purpose of this club to promote harmony among all persons in the electrical business in that part of the country. Kurt R. Sternberg was elected the first president. The rest of the officers are: Secretary, L. J. Kemper; treasurer, Fred Rogers, Jr.; chairman of publicity committee, C. M. French; executive commmittee, W. P. Hodge, chairman, A. W. Hopkins and W. K. Tuohey.

The eleventh annual convention of the Southwestern Electrical & Gas Association will be held at the Galvez Hotel, Galveston, Texas, on May 19-22, 1915.

The Society for the Promotion of Engineering Education has just issued No. 7 of Vol. V of its *Bulletin*. This issue is bound in blue cloth and contains lists of officers, council, and members. It also contains the society constitution and by-laws. This *Bulletin* was published under the direction of the publication committee consisting of A. Marston, H. H. Norris, and F. L. Bishop.

At the recent meeting in Buffalo of the Association of Edison Purchasing Agents the following officers were elected to hold office for a year:

W. H. Francis, president, Edison Elect. Illg. Co., Boston, Mass.
Andrew Banks, first vice-president, Consolidated Gas El. Lt. & Pwr. Co., Baltimore, Md.
J. W. Brennan, second vice-president, Edison Illg. Co., Detroit, Mich.
D. R. Blaicher, treasurer, Minneapolis Genl. Elect. Co., Minneapolis, Minn.
H. F. Frasse, secretary, Edison Electric Illuminating Co., Brooklyn, N. Y.

Thomas A. Watson, who was model maker, mechanician, and general handy man for Alexander Graham Bell in 1874 when the development of the telephone was under way, gave a lecture on "The Birth and Babyhood of the Telephone" at a meeting of the New York Electrical Society, 29 West 39th street, New York, on the evening of April 14.

At a meeting of the American Institute of Electrical Engineers, 29 West 39th street, New York, on April 9, L. F. Fuller read a paper entitled: "Continuous Waves in Long-Distance Radio Telegraphy." On April 15-16 the Institute held a meeting in Pittsburgh under the direct direction of the Pittsburgh Section and the Industrial Power Committee. Among the papers presented at this meeting were several on the control of both alternating and direct current motors in iron and steel mills. The annual convention of the Institute will be held at Deer Park, Md., June 29 to July 2, 1915. John H. Finney is chairman of the convention committee. Among the papers to be presented at this convention are the following: "Under-Running Third Rail Conductors," by E. B. Katte; "Instrument Transformers," by C. L. Fortescue; "The Induction Watt-hour Meter," by B. L. Hollister; "Economic Operation of Electric Ovens," by P. W. Gumaer. The Institute will hold its Panama-Pacific Convention at San Francisco, Cal., September 16-18.

The "Proceedings of the American Electric Railway Engineering Association for 1914" have just come off the press. The association shows unusual enterprise in issuing its annual volume so early in the year. Coming so soon after the close of 1914, the proceedings of this association still have a news value. In this respect they differ from the permanent records issued by most associations, whose annual volumes are invariably belated. Many of them seem to have so hard a time getting clear of editorial and press rooms that the contents are dead, and the reading members interested in more live matters, long before the permanent bound record of the preceding year makes its appearance. This volume contains over 500 pages of committee reports and discussions thereon as presented at the annual convention held at Atlantic City, last October.

The Electrical Contractors' Association of Westchester County, C. E. Youmans, secretary, held a profitable meeting Saturday afternoon, April 17, in the Hollywood Inn, Yonkers, N. Y. The annual report of the treasurer was read, and a resolution adopted reducing the annual dues by more than 50 per cent. A committee was also appointed to look after certain legislation which is now before the New York State Legislature. A dinner committee was appointed to provide an annual dinner and entertainment. The matter of labor agreements was also discussed and the agreement committee was instructed to confer with the local union regarding certain local conditions unsatisfactory to the contractors.

ELECTRICAL DEVELOPMENT SOCIETY

George W. Hill has joined the staff of the Society for Electrical Development. He will devote his time to the work of the field co-operative section. Mr. Hill is a graduate of Tufts College, and has been in the electrical field continuously since his graduation.

An appropriation which will be sufficient to insure the advertising of "Electrical Prosperity Week" in every city and town in the country, was recommended by the "Electrical Prosperity Week" committee, which met April 7 at the Engineers' Club, New York. This recommendation was submitted to the board of directors of the society and approved by it at its meeting on April 19. The committee's recommendation as to plans carried with it an appropriation of $50,000 for special expenditures, such as printing and extraordinary expenses. In addition to this the society will devote a large part of its regular appropriation to the work. This will make the society's expenditures alone far above $100,000. This money will all come from its regular subscription funds contributed by its members.

These members will receive the greater benefits from the expenditures, though the whole industry and country will profit in the educational and sales work. While the society will handle the details of the big affair, and spend a large sum of money in carrying on the campaign, leading electrical manufacturers and jobbers have declared their intention of spending thousands of dollars in national publicity. Each company will tie its campaign in with the society's co-operative movement. Central stations, contractors, and dealers will take advantage of the national campaign to obtain local results by handling sales campaigns of their own during that week.

The Consolidated Gas, Electric Light & Power Co., of Baltimore, has recently joined the society. The trend toward improved business conditions has brought in a number of the central stations which have heretofore been following a strict retrenchment policy. A short time ago one of the larger holding companies placed all its subsidiary companies in the society's membership list. A vigorous campaign for new members is being carried on with splendid results.

The annual meeting of the members of the Society for Electrical Development, Inc., will be held on Tuesday, May 11, 1915, at 10:30 a. m., at the offices of the society, United Engineering Societies' Building, 29 West 39th street, New York. The board of directors will meet directly after the annual meeting to elect officers for the ensuing year and to take up any other business which may be brought before them.

FOREIGN TRADE OPPORTUNITIES

The Bureau of Foreign and Domestic Commerce maintains branch offices in eight commercial centers, where business men may more readily avail themselves of the service of the Bureau. Reserved addresses in connection with "Foreign trade opportunities" and all lists of names offered in connection with articles published in Commerce Reports may be obtained from the nearest office by application in letter form. The list of offices follow: New York, 409 United States Customhouse; Chicago, 629 Federal Building; New Orleans, 1020 Hibernia Bank Building; San Francisco, 410 United States Customhouse; Atlanta, 52 Post Office Building; Seattle, 922 Alaska Building; Boston, 752 Oliver Building; St. Louis, 402 Third National Bank Building.

No. 16451. Electrical Supplies, Etc.—The Bureau of Foreign and Domestic Commerce is in receipt of a letter from a business firm in the United States transmitting a communication from a firm in Switzerland which desires to purchase electric wires and ribbons. Samples are requested.

No. 16451. Copper Wire and Sheets.—A business man in Spain desires to communicate with American manufacturers and exporters of copper wire,, ingots and sheets for the manufacture of dynamos, motors, etc., and material for insulating the wire, etc.

No. 16233. Electrical Supplies.—An American consular officer in Spain reports that a business man in his district has requested that he be supplied with samples, prices, etc., on electrical supplies for a continuous current, voltage 110 to 130. He is especially interested in enameled attachment plugs, etc., contacts, switches, sockets of all kinds, insulated wires, flatirons, warming pads, and various other kinds of heaters. Quotation units should be stated, and weights given per quoted unit in metric system. It is stated that United States bank reference can be given. Correspondence must be in Spanish.

No. 15971. Electric Light Plants.—An American company owning and operating an electric light plant in Central America has informed an American consular officer that it is contemplating the installation of similar plants in other cities in that country. Correspondence should be with the manager of the company in Central America and with the company's home office in the United States.

No. 15976. Electrolytic Copper.—An import agent in one of the neutral countries has informed an American consular officer that he desires cable quotations for the prompt delivery of 200 tons of electrolytic copper in bars. He will pay cash f. o. b. vessel in New York.

No. 16259. Inner Globes for Arc Lamps.—An American consular officer in England reports that a firm in his district desires to be placed in communication with American manufacturers of inner globes, heat-resisting glass, for arc lamps. Prices should be stated c. i. f. British ports.

No. 16287.—Lamps, Gas Mantles, and Batteries.—A business man in Italy informs an American consular officer that he wishes to receive quotations, samples, and full information relative to kerosene lamps, gas mantles, and dry batteries for electric pocket lamps. Quotations should be made c. i. f. destination. Payment will be made upon delivery of goods. A sample of the gas mantle may be examined at the Bureau of Foreign and Domestic Commerce or its branch offices.

No. 16428. Electrical Supplies—A firm in Italy informs an American consular officer that it desires to receive catalogues, prices, etc., from American firms manufacturing electrical supplies and electric motors, etc.

No. 16436. Power Plant.—An American consular officer in Latin America reports that it is understood that a concession for an electric power and light plant for a town of 7,000 inhabitants will be let to an American corporation in the near future. It is stated that the corporation now controls a number of public utilities. The power plant will probably be operated by steam at first and later by water power.

No. 16369. Miners' Electric Lamp Cases.—A safety lamp company in England informs an American consular officer that it desires to secure the names and addresses of American manufacturers of miners' electric lamp cases.

No. 16118. Electrical Supplies, Leather Belting, and Bags, Etc.—An American consular officer in Russia reports that a business man in his district desires to represent American firms for the sale of electrical supplies, oil engines, leather belting, bags, etc. References are given. Correspondence should be in Russian or German.

No. 16150. Electrical Supplies and Machinery.—A business man in Mexico has informed an American consul that he is preparing to open a store for the sale of American electrical supplies and machinery. A copy of the consul's complete report may be had on application to the Bureau of Foreign and Domestic Commerce or its branch offices.

No. 16290. Incandescent Lamps.—A business man in France informs an American consular officer that he desires to be placed in communication with American manufacturers of incandescent lamps.

No. 16173. Electrical Goods.—An American consul in Spain reports that a business man in his district desires to secure information relative to electrical goods, such as bulbs, heaters, irons, etc. Catalogues and correspondence should be in Spanish.

No. 16175. Electric Bells, Etc.—An American consular officer in France reports that a business man in his district wishes to represent American exporters and manufacturers of electric bells, etc. Reference is given.

No. 16102. Electric Lamps, Bulbs, Fixtures, and Wires.—An American consul in Russia reports that a firm in his district desires to place orders for electric lamps, bulbs, fixtures, and wires. Correspondence should be in Russian or French. Quotations should be c. i. f. Tiflis or Batum.

No. 16092. Electrical Machinery.—An American consular officer in South America has transmitted a report relative to a possible opportunity for the sale of machinery for an electric light plant and equipment for a tramway. A copy of the complete report may be had on application to the Bureau of Foreign and Domestic Commerce or its branch offices.

INQUIRIES

Inquiries which we have been unable to answer have been received for the names and addresses of manufacturers of the articles listed below.

Replies from our readers to any or all of these are cordially welcomed both for publication here, and for incorporation as well in our Classified Index of Manufacturers.

In the interests of the good services which this department is expected to render, we would impress upon correspondents the advisability of making their inquiries as specific as possible. This will help materially in obtaining the desired information.

"ABC" National auto horn.
"New Easy" gas burner.
"Eddy" telephone receiver cord.
"Peerless" expansion bolt.
"Red-y" wire solder.
"Franklin" arc lamp.
"Vita" electric cooking apparatus.
"No Kair" electric stove.
"Zwicke" insulated wire.
"Bohler" magneto.
"Parmot" moulding.
"Severn" gasoline engine.
Address of Try Fireless Cooker Co.
"Eureka" porcelain knob.
"Radio" electric hair waver.
"Utility" lantern.
"Rohne" electric heating pad.
"Emco" gauge tester.
"Bedell" sad iron.
"Tugan" resistance wire.
"Vaco-Lite" flashlight lantern.

CONSULTING ENGINEERS

A. G. Shaver has opened an office as consulting engineer at 1640 Transportation Building, Chicago, where he will give particular attention to work in railway signaling, telephone and electric power-plant construction, and the design of high-tension transmission lines. Mr. Shaver recently resigned as secretary of the Hallett Iron Works, manufacturers of line material and tools, Harvey, Ill. He was formerly signal engineer for the Chicago, Rock Island & Pacific and Union Pacific railroads and for the Hall Signal Company, New York.

H. Whitford Jones and Hugh Stanley Carr announce that the copartnership heretofore existing between them has been dissolved. Mr. Carr has opened an office at 918 Citizens Building, Cleveland, Ohio, where he will continue the general practice of consulting electrical engineering. Mr. Jones will retain his office at 1303 Citizens Building, where he will specialize as formerly in industrial and municipal engineering.

NAVY DEPARTMENT BIDS WANTED

The Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will open bids in the city of Washington on the date specified for the electrical supplies listed below.

Those who wish to submit bids should fill in the special application blanks, which are furnished by the Bureau on request, and should fill in these blanks with the numbers given in the "Sch." column in the list below on which they want to bid.

After having been properly filled out, these blanks should be mailed to the Bureau without delay.

The specifications will then be forwarded, or as soon as they are received from the Public Printer.

These specifications, or schedules, as they are officially called, may be obtained also by applying in the same way to the Navy Pay Office nearest each of the Navy Yards mentioned.

Opening May 4, 1915

Article.	Quantity.	Delivery at Navy Yard.	Sch.
Cable, double-conductor	10,000 feet	Newport, R. I.	8179
Cable, 3-conductor	Miscellaneous	Philadelphia, Pa.	8176
Do	do	Norfolk, Va.	8178
Cable, telephone	do	do	8179
Dynamotors, d.c. and a.c.	2	Brooklyn, N. Y.	8213
Dynamotors, rigging, telephone	Miscellaneous	Newport News Va.	8214
Generator, telephone motor	1	Brooklyn, N. Y.	8213
Generator, telephone talking motor	1	Newport News Va.	8214
Jacks, telephone	Miscellaneous	Brooklyn, Newport News, Va.	8213 8214
Mica, sheet, uncut	200 pounds	Newport, R. I.	8200
Panels, battery charging	2	do	8214
Panels, switchboard	6	Philadelphia, Pa.	8198
Pyrometers, electric indicator and recorders	Miscellaneous	Washington, D. C.	8205
Switchboards, fire-control telephone	2	Brooklyn, Newport News, Va.	8213 8214
Switchboards, ships' telephone	1	Brooklyn, N. Y.	8213
Telephones, spare parts, etc.	Miscellaneous	Newport News Va.	8214
Telephones, fire control	118	do	8214
Telephones, fire control and manœuvering	Miscellaneous	Brooklyn, N. Y.	8213
Transformers, 50 K. W.	3	Norfolk, Va.	8179
Wire, lighting and power	7,500 feet	Brooklyn, N. Y.	8185

NEW CATALOGUES

National X-Ray Reflector Co., Chicago, Ill.
Weekly sales letter and bulletins. Describing installations of Eye-Comfort lighting systems in Continental factories.

Max Perwien, St. Paul, Minn.
Catalogue No. 1. Parts for lighting fixtures, 22 pages.

National Lamp Works, Engineering Dept., Cleveland, Ohio.
Bulletin No. 15 B. Lighting of billboards and large painted signs, 12 pages.

Crescent Brass Mfg. Co., Reading, Pa.
Supplement Catalogue No. 4. Chandelier castings and fittings, 32 pages.

Sullivan Machinery Co., Chicago, Ill.
Bulletin 65-C. Diamond core drills, 36 pages.
Bulletin 71-A. Air lift pumping, 32 pages.

New York Gas and Electric Appliance Co., New York.
Catalogue No. 18. Lighting fixtures and supplies, 184 pages.

Bright Star Battery Co., New York.
Catalogue. Mars-Bright and Mars batteries.

Cooper-Hewitt Electric Co., Hoboken, N. J.
Bulletin No. 58. Cooper-Hewitt electric lamps for photographic processes, 20 pages.

Friedley-Voshardt Co., Chicago, Ill.
Catalogue. Stamped parts for lighting fixtures, 48 pages.

Fort Wayne Electric Works of G. E. Co., Fort Wayne, Ind.
Bulletin Index. Subjective index to active bulletins.
Bulletin No. 45201. Type A transformers of large capacities, 8 pages.
Bulletin No. 46100. Type M demand indicators, 12 pages.
Bulletin No. 46101. Type P demand indicators, 12 pages.
Bulletin No. 48100. Commutating pole D. C. crane and hoist motors, 20 pages.

Pittsburgh Reflector and Illuminating Co., Pittsburgh, Pa.
Booklet No. 10. Show window lighting, 28 pages.

Adams-Bagnall Electric Co., Cleveland, Ohio.
Catalogue No. 139. Gyrofans and their applications, 8 pages.
Folder C-211. Jandus Gyrofans.

Chelten Electric Co., Philadelphia, Pa.
Bulletin. Non-arcing enclosed fuses.

Welding Materials Co., Inc., New York.
Bulletin. Variable voltage arc welders.

Pass and Seymour Inc., Solvay, N. Y.
Sheets. Additions to wiring devices catalogue.

W. R. Ostrander and Co., New York.
Booklet. Miniature encyclopedia of approved fittings for fire alarm systems in New Jersey.

Peerless Light Co., Chicago, Ill.
Wall Hanger. New lighting fixture parts and devices.

Hotpoint Electric Heating Co., Ontario, Cal.
Broadside. Cooking and heating devices.

Lagonda Mfg. Co., Springfield, Ohio.
Booklet T-1. Boiler room specialties, 16 pages.

Trumbull Electric Mfg. Co., Plainville, Conn.
Folder. Star-Delta motor starting switches.

Luminous Unit Co., St. Louis, Mo.
Folder. Brascolites.

Robbins and Myers Co., Springfield, Ohio.
Folder. Type P single phase motor.

Ellington Electric Co., Quincy, Ill.
Folder. Unit charger for storage batteries.

Independent Electric Machinery Co., Kansas City, Mo.
Folder. Charging outfit for storage batteries.

Detroit Fuse & Mfg. Co., Detroit, Mich.
Condensed Price List. Arkless indicating enclosed fuses.

Peerless Electric Co., Warren, Ohio.
Folder. W-9 frame, bipolar motor and generator.

National Metal Molding Co., Pittsburgh, Pa.
Mailing Card. Flexitube.

Victor Storage Battery Co., Rock Island, Ill.
Booklet. S.O.S. storage batteries. 24 pages.

Hunter Fan and Motor Co., Fulton, N. Y.

Catalogue No. 105. 1915 electric fans.

Electric Service Supplies Co., Philadelphia, Pa.
Folder. Never-creep anchors.

Hygrade Incandescent Lamp Co., Danvers, Mass.
Wall Card. Hygrade tungsten lamps.

Benjamin Electric Mfg. Co., Chicago, Ill.
Discount sheet. Applying to catalogue B-20.

Star Fuse Co., New York.
Catalogue No. 3. Star renewable cartridge fuses, 12 pages.

Detroit Fuse & Mfg. Co., Detroit, Mich.
Bulletin No. 33. Square D enclosed entrance switches and distributing cabinets, 8 pages.
Folder. Ironclad fused switch.

Yost Electric Mfg. Co., Toledo, Ohio.
Booklet. Sockets, 12 pages.

Robbins & Myers Co., Springfield, Ohio.
Booklet. 1915 electric fans, 24 pages.

Bryant Electric Co.
Folder. Push button switch.

Harvey Hubbell, Inc., Bridgeport, Conn.
Bulletin No. 15-7. Duplex flush receptacles.
Bulletin No. 15-8. Signal attachment plugs.

Luminous Unit Co., St. Louis, Mo.
Catalogue No. 4. Brascolite illumination, 24 pages.

Diehl Mfg. Co., Elizabeth, N. J.
Folder. Small motors with interchangeable frames.
Folder. Sewing machine motors.
Folder. Type G motors.
Folder. Type K motors and generators.

Henry D. Sears, Boston, Mass.
Booklet. Weber universal sockets, 16 pages.

Hart & Hegeman Mfg. Co., Hartford, Conn.
Mailing Card. Tri-Use fittings.

P R Manufacturing Co., Detroit, Mich.
Mailing Card. P R Eclipse bell.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Leaflet No. 3751. Current limiting reactance coils.
Folder No. 4226. How electric power helps manufacturers, 16 pages
Folder No. 4205. Westinghouse Cooper-Hewitt rectifier for moving picture service.
Folder No. 4152-A. Sewing machine motor.
Folder No. 4266-A. Electric breakfast set.
Dealers' Catalogue, Sec. DS300. 1915 electric fans.
Leaflet No. 3698-A. Motors for linotype and intertype machines.
Leaflet No. 3770. Type C cam limit switches.
Folder No. 4201. The A B C of automobile battery charging.
Leaflet No. 3679. Electric vehicle battery-charging switchboards and motor-generator sets.

Cooper Hewitt Electric Co., Hoboken, N. J.
Pamphlet. Light as a factor of efficiency, 12 pages.

Moloney Electric Co., St. Louis, Mo.
Catalogue No. 150. High and low tension transformers, 48 pages.

Harrison Safety Boiler Works, Philadelphia, Pa.
Leaflet No. 18. Testing liquid flow meters of large capacity, 48 pages.

NEWLY APPROVED FITTINGS

Cabinets

Cabinets shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters. Made by Federal Electric Co., Lake and Desplaines streets, Chicago, Ill.

Cabinets shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters. Made by Sterling Switchboard Co., 537-545 S. Seventh street, Camden, N. J.

Insulating Paint

A black liquid, drying with a gloss finish and remaining soft and pliable. For use in coating wires, cables, splices and other places where an insulating paint is desirable. Made by T. J. Hadley, Brunswick Hotel, Winnipeg, Canada.

Lightning Rods

This manufacturer makes a specialty of installations where subject to corrosion, and furnishes lightning rods and fittings equipped with lead protective coatings. Made by Ajax Lightning Conductor Co., 412-422 N. Sangamon street, Chicago, Ill.

Molding

"Pagrip" metal molding. Made by Pague Mfg. Co., 411 S. Clinton street, Chicago, Ill.

Panelboards

Panelboards shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters. Made by Wells Mfg. Co., 1562 Wells Street, Chicago, Ill.

Signs' Electric

Electric signs shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters. Made by Northwestern Electric Works, 7-10-22 Corn Exchange, Minneapolis, Minn.

JOVIAN LEAGUES

For the information of Jovians who visit any of the following cities we give below the time and place at which each of the several Luncheon Clubs meet:

AKRON—Monday, 11:30 a. m., Black Whale Inn.

BALTIMORE—Thursday, 12:30 p. m., Emerson Hotel.

BENTON HARBOR—Second Tuesday of month, place determined by members.

BLUEFIELD—Last Saturday of month, 7:30 p. m., Altamont Hotel.

BOISE—Every other Thursday, 12 m., Commercial Club or Owyhee hotel.

BUFFALO—Saturday, 12:30 p. m., Lafayette Hotel.

CALGARY—Twice a month, 12:15 p. m., Cronn's Rathskeller.

CHARLOTTE—First and third Saturday of month, 1 p. m., Gem Cafe.

CHATTANOOGA—Thursday, 12:30 p. m., Read House.

CHICAGO—Monday, 12:15 p. m., Hotel Sherman.

CINCINNATI—Every other Monday, 12:30 p. m., Gibson Hotel.

CLEVELAND—Thursday, 12 m., club rooms, Hollenden Hotel.

COLUMBUS—Every other Thursday, 6 p. m., and 12 m., alternately different hotels.

DALLAS—Monday, 12 m., Oriental Hotel.

DAYTON—First and third Monday of month, 12 m., Algonquin Hotel.

DES MOINES—Sat. 12:30 p. m., Kirkwood and Randolph, alternately.

DETROIT—First and Third Saturday of month, 1 p. m., Board of Commerce.

DULUTH—Second and fourth Wednesday, 12:15 p. m., St. Louis Hotel.

ERIE—First and third Monday of each month, 6:30 p. m., Reed House.

FORT WAYNE—15th of each month, hour selected, Wayne Hotel.

FORT WORTH—Tuesday, 12:15 p. m., at different cafes.

GALVESTON—Third Monday of month, Galveston Commercial Association.

GRAND RAPIDS—First Sat. of month, 12:15 p. m., Association of Commerce.

HARTFORD—Thursday, 12:30 p. m., Bond's Cafe.

HOUSTON—Tuesday, 12:15 p. m., Bender Hotel.

HUNTINGTON—Last Friday, each month, Frederick Hotel.

INDIANAPOLIS—Monday, 12:15 p. m., Hotel Severin.

KNOXVILLE—First Tuesday of month, 12 m., Imperial Hotel.

LA CROSSE—Second and last Monday of month, 12 m., La Crosse Club.

LETHBRIDGE—First Monday of month, 8 p. m., offices of Municipal Railway.

LEXINGTON—First Tuesday after tenth of month, Phoenix Hotel.

LOS ANGELES—Wednesday, 12 m., Christopher's, No. 551 S. Broadway.

LOUISVILLE—Tuesday 12:15 p. m., Preston Hotel.

MILWAUKEE—Every other Tuesday, 12:15 p. m., Hotel Blatz.

MINNEAPOLIS—Every other Tuesday, 12 m., breakfast room, Rogers Hotel.

MONTREAL—Thursday, 12:30 p. m., Cooper's Restaurant, Notre Dame street West.

NASHVILLE—First and third Saturdays, 12:30 p. m., and second and fourth Thursdays, 6:30 p. m., Tulane Hotel.

NEW CASTLE—Every Wednesday, 12 m., Y. M. C. A.

NEW ORLEANS—Second and Fourth Tuesday, 12:05 p. m., Hotel De Soto.

NEW YORK—First and third Wednesday of month, 12:30 p. m., Hotel Martinique.

NORFOLK—Fourth Friday of month, 8 p. m., Hotel Fairfax.

OKLAHOMA CITY—Friday, 12 m., Skirvin Hotel.

PEORIA—First and third Saturday of month, 1 p. m., Jefferson Hotel.

PHILADELPHIA—Thursday, 12:30 p. m., Hotel Adelphia.

PITTSBURGH—Thursday, 12:15 p. m., Fort Pitt Hotel.

PITTSFIELD—First Saturday of each month, 6:30 p. m., Wendell Hotel. Informal lunch every Wednesday, 12:15 p. m., G. E. Co.'s restaurant, Kellogg st.

PORTLAND—Friday, 12:15 p. m., Benson Hotel.

RICHMOND—Fourth Tuesday each month, 1 p. m., Business Men's Club.

ROCHESTER—Thursday, 12:15 p. m., Chamber of Commerce.

SACRAMENTO—Saturday, 12:15 p. m., Peerless Cafe.

ST. LOUIS—Tuesday, 12:30 p. m., American Annex, Market street.

ST. PAUL—First and third Thursday, 12:10 p. m., Emporium Tea Room.

SALT LAKE—Thursday, 12:15 p. m., Louvre Cafe.

SAN ANTONIO—Tuesday, 12:30 p. m., Menger Hotel.

SAN FRANCISCO—Wednesday 12:15 p. m., 621 Bush street.

SCHENECTADY—Third Wednesday of month, 12:15 p. m., Glenn's Restaurant.

SEATTLE—Friday, 12:30 p. m., Hotel Lincoln.

SIOUX CITY—Thursday, 12 m., different hotels.

SPOKANE—First and third Wednesdays, 12 m., Spokane Hotel.

SPRINGFIELD, OHIO—Last Friday of month, 12 m., Commercial Club.

SYRACUSE—Saturday, 12:15 p. m., Empire Hotel.

TACOMA, WASH.—Tuesday, 12 m., Grill Room, Hotel Olympus.

TOLEDO—Saturday 12 m., Kaiserhof, States Inn, and Stifler & Kest's Cafe.

TORONTO—Friday, 1 p. m., Prince George Hotel.

TWIN FALLS—Third Thursday, 7 p. m., Room 5, Power Building.

WACO—Thursdays, 12 m., Riggins Hotel.

WARREN—Second and fourth Friday, 6:30 p. m., at different places.

WASHINGTON, D. C.—Wednesday, 12:30 p. m., Commercial Club.

WICHITA—Second and last Saturday of month, 12 m., Wichita and Kansas Clubs, alternately.

WINNIPEG—Every other Wednesday of month, 12:15 p. m., St. Regis Hotel.

The new telephone rates ordered by the Public Service Commission of New York, have been accepted by the telephone company and will go into effect on July 1. The most important change ordered by the commission is the cutting of apartment house equipment charges so as to make a general 5 cent rate for local calls of tenants. Toll charges for some outlying districts are also reduced, the amount of the reduction depending on the zone from which the message is sent and the point where the message is received. The minimum message rate for individual direct lines in zones 1, 2, 4, and 5 for both business and residence service is reduced from $48 for 800 messages to $40 for 800 messages. The telephone company offered 840 messages for $42 for service of this kind, but the commission would not accept it. All flat rates and flat rate service within the city of New York are to be preserved.

The earnings report of the Western Union Telegraph Co., Inc., for the three months ended March 31, 1915, showed a net income of $622,287 in excess of that of the first three months of 1914.

RECENT ELECTRICAL PATENTS

Batteries

1,132,986. *System of Charging and Discharging Storage Batteries During Forming Process.* William A. Turbayne, Buffalo, N. Y. assignor, by mesne assignments, to Central Trust Co. of New York.

1,132,846. *Electric Battery.* Valentine Holzapfel, Jr., Bayonne, N. J.

1,134,452. *Thermo-Electric Battery for Motor-Vehicles.* Leigh E. Hale, Stockton, Cal., assignor of one-half to Floyd C. Bolin, Stockton, Cal.

1,130,710. *Electric Battery.* Henry Csanyi, New York, N. Y., assignor to Maxivolt Primary Battery Co., New York.

1,132,183. *Battery-Separator.* Charles P. Hidden, New York, N. Y.

1,134,093. *Electric Battery.* William Charles Bauer, Evanston, Ill.

Controlling and Regulating Devices

1,131,218. *Electrically-Controlled Brake Mechanism.* Edward H. Dewson, New York, and Walter V. Turner, Edgewood, Pa., assignors to The Westinghouse Air Brake Co., Wilmerding, Pa.

1,134,770. *Power Transmitting and Controlling Mechanism.* August Sundh, Yonkers, N. Y., assignor to Otis Elevator Co., Jersey City, N. J.

1,134,197. *Dynamic-Braking Controller.* Clark T. Henderson, Milwaukee, Wis., assignor to The Cutler-Hammer Mfg. Co., Milwaukee, Wis.

1,134,346. *Electric-Lamp Regulator.* Chester C. Oberly, Chicago, Ill., assignor to The Pullman Co., Chicago, Ill.

1,133,663. *Distant Control System for Electric Motors.* George A. Pierce, Philadelphia, Pa., assignor to William Cramp & Sons Ship & Engine Building Co., Philadelphia, Pa.

1,131,175. *System of Electrical Regulation.* William A. Turbayne, Niagara Falls, N. Y., assignor, by mesne assignments, to Central Trust Co. of New York.

1,130,969. *Circuit-Controller.* Arthur H. Fleet, Milwaukee, Wis., assignor to The Cutler-Hammer Mfg. Co., Milwaukee, Wis.

1,131,434. *Electrical Regulation.* William Snee and John A. Snee, Jr., West Elizabeth, Pa.

1,132,444. *Circuit-Controller.* John P. Coleman, Edgewood Borough, Pa., assignor to The Union Switch & Signal Co., Swissdale, Pa.

1,133,783. *Controller for Lighting-Circuits of Dynamo-Battery Equipments.* Vincent G. Apple, Dayton, Ohio, assignor to The Apple Electric Co., Dayton, Ohio.

1,134,370. *Electric Control-Gear for Automatic Grab-Cranes.* Koloman Brüll, Pestszentlörinez, Austria-Hungary.

1,133,977. *Electric Propusion and Control for Motor-Boats.* James Lamb, Canton, Ill.

Electric Switches and Cutouts

1,134,422. *Electric Switch.* Harry F. Stratton, Cleveland, Ohio, assignor to The Electric Controller & Mfg. Co., Cleveland, Ohio.

1,132,750. *Electric Switch for Portable Electric Lights.* Bernard Tauber, New York, assignor to Interstate Electric Novelty Co., New York.

1,132,470. *Switch.* David D. Gordon, Chicago, Ill., assignor to Gordon Electric & Mfg. Co., Chicago, Ill.

1,133,285. *Snap-Switch.* Charles Horn, Millbourne, Pa.

1,133,032. *Oil-Switch.* Ernest H. Jacobs, Schenectady, N. Y., assignor to General Electric Co.

1,134,732. *Electric Switch.* Frederic P. Gates, Hartford, Conn., assignor to The Arrow Electric Co., Hartford, Conn.

1,132,154. *Electric Pull-Switch.* Charles A. Bliley, Cripple Creek, Colo., assignor of one-half to Ernest A. Colburn, Jr., Victor, Colo.

1,133,549. *Party-Line Cut-Out.* William B. Francis, Prague, Okla.

1,131,140. *Automatic Switch for Telephone Systems.* William Kaisling, Chicago, Ill., assignor to Kellogg Switchboard & Supply Co., Chicago, Ill.

1,131,129. *Switching Device.* David D. Gordon, Chicago, Ill., assignor to Yost Electric Mfg. Co., Toledo, Ohio.

1,134,534. *Automatic Electrical Switch.* William H. Hill, Oakwood, Ohio.

1,132,116. *Cut-Out Box.* Alfred L. Pierce, Wallingford, Conn.

Generators, Motors, and Converters

1,132,992. *Dynamo-Electric Machine.* James J. Wood, Fort Wayne, Ind., assignor to General Electric Co.

1,133,524. *Electric-Current Conducting and Distributing Means.* Frank A. Zika, Chicago, Ill., assignor of one-half to James E. Barry, Chicago, Ill.

1,134,739. *Electric-Motor Brake.* Arthur E. Handy, Brooklyn, N. Y., assignor to Otis Elevator Co., Jersey City, N. J.

1,131,614. *Electric Motor.* Albert A. Radske, Chicago, Ill., assigner to Electric Time Recorder Co.

1,130,755. *Electric Generator.* John Lewis Milton, Anderson, Ind.

1,131,551. *Dynamo-Electric Machine.* Albert Mexander Price, London, England.

Heating Devices

1,134,818. *Electrical Heating Unit and Resistance-Coil.*. Louis William Campbell, South Yarra, Victoria, Australia.

1,130,734. *Electric Furnace.* William Smith Horry, Niagara Falls, N. Y., assignor to Union Carbide Co., New York.

1,130,916. *Electric Bath-Cabinet.* Honora C. Marrinan and John Gorman, St. Paul, Minn.

1,131,651. *Thermostat.* George C Andrews, Minneapolis, Minn.

1,133,346. *Electric Heating-Stopper for Liquid Containers.* Ernest C. Webster and Henry Gruenhagen, Oakland, Cal.

1,134,817. *Electric Furnace.* John W. Brown, Lakewood, Ohio, assignor to National Carbon Co., Cleveland, Ohio.

1,132,299. *Electric Flat-Iron.* Henry Price Ball, Pittsfield, Mass., assignor to General Electric Co.

1,131,060. *Electric Heater.* William S. Hadaway, Jr., New Rochelle, N. Y.

1,133,098. *Electric Heating and Cooking Stove.* Arthur O. Christensen, Franklin Furnace, N. J.

1,131,733. *Thermostat.*. Harry T. Raymond, Minneapolis, Minn., assignor to George C. Andrews, Minneapolis, Minn.

1,134,661. *Electric Heating Device.* McGerry Allmayer, Chicago, Ill.

1,130,987. *Electrical Heater.* Frank Kuhn, Detroit, Mich.

1,134,886. *Electric Stove.* William Foster Merrill, New York.

1,132,604. *Electric Fluid-Heater.* Thomas J. Nash, Lincoln, Nebr.

Lighting Devices

1,132,751. *Portable Electric Light.* Bernard Tauber, New York, assignor to Interstate Electric Novelty Co., New York.

1,132,008. *Electric Lamp.* Laurence A. Hawkins, Schenectady, N. Y., assignor to General Electric Co.

WANTS—FOR SALE—AGENTS

DO YOU WANT A LIVE NEW YORK REPRESENTATIVE? We have been established many years, well known to the trade, have good sales organization, and warehouse facilities. Sold $70,000 worth of one manufacturer's products last year. We are increasing our sales organization, and will be able to handle an additional line or two. Only first class connection and high grade electrical apparatus, or specialties, will be considered. Address, Electric Room, 907, 171 Madison Ave., New York.

DESIGNER—An architectural designer of twelve years' experience wishes to obtain position with lighting fixture concern as fixture designer. American and European training. Clever with pen-and-ink, pencil and watercolor. Address Box 5-B, c/o ELECTRICAL RECORD.

WELL-ESTABLISHED FIRM AT AMSTERDAM, wholesalers and electrical engineers, are in a position to represent a first-class American firm, in Holland.—Any article in electricity line. Address S. A. J., Suite 610, Evening Post Bldg., New York.

SUPERINTENDENT OR FOREMAN—Position wanted as superintendent or foreman with an electric and gas fixture manufacturing company. Many years' experience in the manufacture of electric and gas fixtures; well posted on ornamental pattern work, designing, mechanical drafting. Address Box 5-A, c/o ELECTRICAL RECORD.

FOR SALE—Buckeye carbon lamps, 110 and 220 volts, 6½c. Send for list; other supply bargains. Smith Electric Fixture Co., Box 568, Charlotte, N. C.

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ACETYLENE LIGHTERS.
See Lighters, Acetylene.

ADAPTERS, Auto Lamp.

For changing Gas or Oil Lamps to Electric.

GENERAL ELECTRIC CO., Schenectady, N. Y.
HUBBELL, INC., HARVEY, Bridgeport, Conn., "Dazlite."
MANHATTAN ELEC'L SUPPLY CO., 17 Park place, New York.
METAL SPECIALTIES MFG. CO., Chicago, Ill., "Gil-Bo."
MORSE, FRANK W., Boston, Mass., "Electrofier."
PLUME & ATWOOD MFG. CO., Waterbury, Conn.
ROSEN & CO., A. W., 610 Broadway, New York, N. Y.
STANDARD ELEC. NOVELTY CO., 10 N. Desplaines st., Chicago, Ill.
Black Mfg. Co., Fort Wayne, Ind.
Campbell Co., A. S., Boston, "Cello."
Castle Lamp Co., Amesbury, Mass.
Chicago Electric Mfg. Co., Chicago.
Cole & Co., Henry, Boston, Mass.
Gray & Davis, Cambridge, Mass.
Horn & Brannen Mfg. Co., Phila.

ADAPTERS, Lamp.

Tungsten Adapters.
Socket Adapters & Extensions.

RENJAMIN ELECTRIC MFG. CO., 120 So. Sangamon st., Chicago, Ill. (Tungsten Adapters).
BRYANT ELEC. CO., Bridgeport, Conn. (Candelabra).
FEDERAL SIGN SYSTEM (ELEC.), Lake & Desplaines sts., Chicago, Ill.
HUBBELL, INC., HARVEY, Bridgeport, Conn.
WHITE MFG. CO., J. H., 111 N. Third st., Brooklyn, N. Y. (Tungsten).
Advance Mfg. Co., Pittsburgh, Pa.
Arrow Electric Co., Hartford, Conn.
Erikson Elec. Co., L., Boston, Mass. (Tungsten Adjustable Joint).
Phila. Elec'l & Mfg. Co., Phila., Pa.
Westinghouse Lamp Co., New York.

ADJUSTABLE FIXT. BRACKETS.
See Fixtures, Adjustable.

ADJUSTERS, Cord & Lamp.

AUSTIN & CO., M. B., 700 Jackson blvd., Chicago, Ill., "Gem."
CONDIT ELECTRICAL MFG. CO., Boston, Mass., "Saca."
DIAMOND STATE FIBRE CO., Bridgeport, Pa.
GUND MFG. CO., 320 Jay st., La Crosse, Wis., "Two Ball."
McGILL MFG. CO., 39 Oak st., Valparaiso, Ind., "Innovate."
MATTHEWS & BRO., W. N., 3705 Forest Park blvd., St. Louis, Mo., "Easy."
MORSE, FRANK W., Boston, Mass. ("Handy" Cord and "Webster" Lamp Adjuster).
PHELPS MFG. CO., Detroit, Mich. ("Any Angle" Lamp Fixture).
TRUMBULL ELECTRIC MFG. CO., Plainville, Conn.
YOST ELEC. MFG. CO., Toledo, O. ("Electrogrip" Lamp Adjuster).
Advance Mfg. Co., Pittsburgh, Pa., "Heinz."
American Enamel Co., Providence.
American Vulcanized Fibre Co., Wilmington, Del., "C. & C."
Bates, H. A., Garwood, N. J., "Slip-on."
Carter & Co., J. W., Abilene, Texas, "Eclipse."
Cohn, Adolph, West Hoboken, N. J., "Rela."
C. & D. Mfg. Co., Dayton, O.
Electric Specialty Mfg. Co., Pittsburgh, Pa., "King."
Estes & Sons, E. B., New York (Wood).
Gem Mfg. Co., Lancaster, Pa.
Hagstrom Bros. Mfg. Co., Lindsborg, Kan. (Push Button).
Harter Specialty Co., Waukegan, Ill.
Johnny Co., Greenville, O.
Lorentz, Henry E., Baltimore, Md.
Milam & Son, B. C., Frankfort, Ky.
Novelty Turning Co., Norway, Me.
Reel Adjustable Fixture Co., Chicago.
Runzel-Lenz Electric Mfg. Co., Chicago, Ill. ("R-L" Telephone Switchboard Cord Length Adjuster).
Stewart Elec. Co., F. H., Phila., Pa.

ADJUSTERS, SOCKET CHAIN.
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ADJUSTERS, Switchplate.

Elec. Apparatus Co., Chicago, Ill.

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AGENTS, Manufacturers.

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ALABASTER BOWLS.
See Bowls, Marble & Alabaster.

ALARMS, BURGLAR.
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ALARMS, FIRE.—See Fire Alarms.

ALARMS, Rain.

Electric Devices & Mfg. Co., Chicago, Ill.

ALARMS, Tank.

OSTRANDER & CO., W. R., 22 Dey st., New York, N. Y., "Neu."
PARTRICK & WILKINS CO., Philadelphia, Pa.
STANLEY & PATTERSON, 23 Murray st., New York, N. Y., "Patterson."
WALDMAN, JOHN J., 136 Liberty st., New York, N. Y.
Irish Electric Co., W. F., New York, "Shamrock."

ALUMINUM.

ALUMINUM CO. OF AMERICA, Pittsburgh, Pa.
Elec. Smelting & Aluminum Co., Lockport, N. Y.
So. Aluminum Co., Whitney, N. C.

ALUMINUM FUSES.
See Fuses, Open Link.

AMMETERS.—See Instruments.

ANCHOR SCREWS.
See Bolts, Expansion.

ANCHORS, Guy, also Rods.

BARNES & KOBERT MFG. CO., Milldale, Conn., "B. & K."
CROUSE-HINDS CO., Syracuse, N. Y., "Harpoon," "Adjustarod."
ELECTRIC OPERATIONS CO., Bush Terminal, Brooklyn, N. Y.
GUND MFG. CO., 320 Jay st., La Crosse, Wis., "D. & T."
LANZ & SONS, M., Pittsburgh, Pa.
MATTHEWS & BRO., W. N., 3705 Forest Park blvd., St. Louis, Mo.
OSHKOSH MFG. CO., Oshkosh, Wis.
ST. LOUIS MALLEABLE CASTING CO., 7777 N. Conduit ave., St. Louis, Mo., "O. K."
Barbed Anchor Mfg. Co., Louisville.
Benicia Iron Works, San Francisco.
Bluffton Anchor Co., Bluffton, O.
Chance Mfg. Co., Centralia, Mo., "Never Creep."
Everstick Anchor Co., St. Louis.
Falls Elec. Co., Lima, O., "Clum."
Hallett Iron Wks., Harvey, Ill., "Hiawatha."
Johns-Manville Co., H. W., New York, N. Y., "J-M."
Klein & Sons, Mathias, Chicago, Ill.
Line Material Co., So. Milwaukee, Wis. (Guy Rods).
Miller Anchor Co., Norwalk, O., "Safety."
New England Bolt & Supply Co., Everett, Mass. (Guy Ropes).
Oliver Iron & Steel Co., Pittsburgh, Pa. (Guy Rods).
Simpson Anchor Co., Niagara Falls.
Specialty Device Co., Cincinnati, O., "Bierce."
Universal Cable Grip Co., Syracuse, N. Y., "Red Top."
Wapak Hollow Ware Co., Wapakoneta, O.

ANNEALING FURNACES AND OVENS.—See Furnaces, Elec.

ANNUNCIATORS, Limousine.

Cowels & Co., C., New Haven, Conn.
O'Brien Co., Joseph F., New York.

ANNUNCIATORS, Standard.

Elevator, Telephone, Hotel, Burglar Alarm.

ANSONIA ELECTRICAL CO., Ansonia, Conn.
CONNECTICUT TELEPHONE & ELECTRIC CO., Meriden, Conn.
DE VEAU TELEPHONE MFG. CO., 477 18th st., Brooklyn, N. Y., "Auth."
EDWARDS & CO., New York, "Dixie," "Etonial," "Semaphore."
HOLTZER-CABOT ELECTRIC CO., Boston, Mass.
MANHATTAN ELECTRICAL SUPPLY CO., 17 Park pl., New York.
MENOMINEE ELEC. MFG. CO., Menominee, Mich.
OSTRANDER & CO., W. R., 22 Dey st., New York.
PARTRICK & WILKINS CO., Philadelphia, Pa., "Competition."
STANLEY & PATTERSON, 23 Murray st., New York, N. Y., "Premier."
Couch Co., S. H., Norfolk Downs, Mass., "Coelco."
Hepburn Tele. Mfg. Co., Chicago (Illuminated).
Moon Mfg. Co., Chicago, Ill., "Knapp," "Eclipse," "Acme."
Samson Elec. Co., Canton, Mass., "Ross," "Rival," "Dandy," "Hub."

ANTI-HUMS.

BUNNELL & CO., J. H., 32 Park pl., New York.
MANHATTAN ELEC'L SUPPLY CO., 17 Park pl., New York.

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Ohio Cross Arms Co., Columbus, O.

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ARMS, CROSS, (Wood).

BARNES - LINDSLEY MFG. CO., Portland, Ore.
BISSELL CO., F., 226 Huron st., Toledo, O.
CENTRAL LUMBER CO., Chattanooga, Tenn.
FOWLER & CO., J. H., Fisher Bldg., Chicago, Ill.
LINDSAY BROS. CO., Spokane, Wash.
SOUTHERN EXCHANGE CO., 97 Warren st., New York, N. Y.
WESTERN LUMBER & POLE CO., Spokane, Wash.
Absher Co., W. M., North Wilkesboro, N. C.
Am. Creosote Wks., New Orleans, La.
Am. Cross Arm Co., Chicago, Ill.
Atlantic Creosoting & Wood Preserving Co., Norfolk, W. Va.
Berlin Mills Co., Portland, Me. (Kyanized).
Berthold & Jennings Lumber Co., St. Louis, Mo.
Boggs & McNeill Co., Albany, Ga.
Cohn & Bock, Princess Anne, Md.
Cranston Lumber Co., John A., Wilmington, Del.
Doty (Wash.) Lumber & Shingle Co.
Elkin Machinery Co., Elkin, N. C.
Ferguson Lbr. Co., Little Rock, Ark.
Georgia Tie & Lumber Co., N. Y.
Gulfport (Miss.) Creosoting Co.
Hamilton & Strong, Colville, Wash.
International Creosoting & Cons. Co., Galveston, Tex.
Lacey Lumber Co., Carrier, Miss.
Lord & Co., L. H., Peoria, Ill.
Louisiana Red Cypress Co., New Orleans, La.
Megahan & Co., Westerville, O.
Morse Lumber Co., Los Angeles.
Noblett Co., E. J., Chattanooga.
Norfolk Creosoting Co., Norfolk, Va.
Roper Lumber Co., Norfolk, Va.
Seattle (Wash.) Timber Supply Co.
South. Pine Mfg. Co., Paducah, Ky.
Swayne R. B., San Francisco, Cal.
Tacoma-Seattle Timber Co., Tacoma.
Texas Arm & Pin Co., Beaumont.
Vuncannon, J. B., West End, N. C.
Wade & Co., Shippensburg, Pa.
Williams Cypress Co., F. B., Patterson, La.
Wykoff Pipe & Creosoting Co., N. Y.
Zeones Lumber Co., Pe Ell, Wash.

ARMS, Mast.

BRADY ELECTRIC MFG. CO., New Britain, Conn.
CUTTER CO., GEO., 411 Notre Dame, South Bend, Ind.
ELECTRIC RAILWAY EQUIPMENT CO., Cincinnati, O.
MORRIS, ELMER P., 136 Liberty st., New York.
Buffalo Specialty Co., Buffalo, N. Y.
Fletcher Mfg. Co., Dayton, O.
Line Material Co., So. Milwaukee, Wis.
Lundin Elec. & Mach. Co., Boston, Mass., "Philbrick."
Phila. (Pa.) Elec'l Mfg. Co.
Russell Elec. Mfg. Co., Providence.

ARRESTERS, Lightning.

Light and Power.

GENERAL ELECTRIC CO., Schenectady, N. Y.
WESTINGHOUSE ELEC. & MFG. CO., East Pittsburgh, Pa., "Wurts."
WOOLLEY, W. DOUGLAS, 30 N. Michigan ave., Chicago, Ill., "C-C Non-Gap."
Arrow Conductor & Mfg. Co., Chicago.
Brach Supply Co., L. S., New York.
Delta-Star Elec. Co., Chicago, Ill.
Elec. Service Supplies Co., Phila.
Gifford El. Mfg. Co., Traverse City, Mich.
Lord Mfg. Co., Brooklyn, N. Y., "Shaw," "Multi-Vapo-Gap," "Abacot."
Oleson Spring Co., Toledo, O.
Railway & Industrial Engineering Co., Greensburg, Pa.

ARRESTERS, Lightning.

Telephone and Telegraph.

BUNNELL & CO., J. H., 32 Park pl., New York, N. Y., "Union," "Triangle."
CHICAGO FUSE MFG. CO., Chicago.
D. & W. FUSE CO., Providence, R. I.
MANHATTAN ELEC'L SUPPLY CO., 17 Park pl., New York, "Union."
RELIABLE ELEC. CO., Chicago, Ill.
Am. Elec. Co., Chicago, Ill.
Automatic Fusible Lightning Arrester Co., Colorado Springs, Colo.
Brach Supply Co., L. S., New York.
Butler Elec. Co., Easton, Pa.
Chance Mfg. Co., Centralia, Mo., "Sky-Rocket."
Cook, F. B., Chicago, Ill.
Cox Arrester Co., C. E., Eaton, Ohio.
Cracraft, Leich Elec. Co., Genoa, Ill. (Self-Cleaning Shunt Arresters).
Ericsson Mfg. Co., Buffalo, N. Y.
Foote, Pierson & Co., New York, "Argus."
Garford Mfg. Co., Elyria, O.
Gifford Elec. Mfg. Co., Traverse City, Mich., "Paradox."
Harvard Elec. Co., Chicago, Ill.
Howard, A. G., Holdredge, Neb.
Insulator Arrester Co., Duluth, Minn.
Kellogg Switchboard & Supply Co., Chicago, Ill.
Minneapolis (Minn.) El. Co., "Chapman."
National Elec. Specialty Co., Toledo, O., "Vac-M."
P. & M. Co., Chicago, Ill.
Railway & Industrial Engineering Co., Greensburg, Pa.
Royal Elec. Co., Sidney, O., "Hypostat."
Schinn, W. C., Lincoln, Neb.
Stromberg-Carlson Tele. Mfg. Co., Rochester, N. Y.

ARTIFICIAL (PHANTOM) LOAD INSTRUMENTS. — See Instruments, Testing.

ASBESTOS.

Sheet, Paper, Mill Board, Lumber.

Acme Asbestos Covering & Supply Co., Chicago.
Carey Mfg. Co., Phillip, Cincinnati.
Ehret Magnesia Mfg. Co., Phila.
Franklin Mfg. Co., Franklin, Pa.
General Asbestos & Rubber Co., Charleston, S. C.
Johns-Manville Co., H. W., N. Y.
Keasbey & Mattison Co., Ambler, Pa.
New Jersey Asbestos Co., Camden, N. J., "Gladiator."
N. Y. Asbestos Mfg. Co., New York.
Norristown Magnesia & Asbestos Co., Norristown, Pa.
Sall Mountain Asbestos Mfg. Co., Chicago.
Watson Co., H. F., Erie, Pa.

ASBESTOS SHADES.
See Shades, Asbestos.

ASBESTOS, WIRE.
See Wire, Asbestos.

ATTACHMENTS.

Gas Fixture.

BRYANT ELEC. CO., Bridgeport, Conn.
MANHATTAN ELEC'L SUPPLY CO., 17 Park pl., New York, N. Y.
PLUME & ATWOOD MFG. CO., Waterbury, Conn.
TRUMBULL ELEC. MFG. CO., Plainville, Conn.
WALSH MFG. CO., OWEN, 525 W. 26th st., New York, N. Y.
WHITE MFG. CO., J. H., 111 N. Third st., Brooklyn, N. Y.
Am. Brass & Copper Co., New York.
American Pin Co., Waterbury, Conn.
Spencer's Sons, I. S., Guilford, Conn.
Steele & Johnson Mfg. Co., Waterbury, Conn.

ATTACHMENTS, Socket.

Socket Pulls.
Chain Adjusters.
Chain Extensions.

HUBBELL, INC., HARVEY, Bridgeport, Conn., "Ham," "Harding," "Economy."
PEERLESS LIGHT CO., Peerless Bldg., Chicago, Ill. ("Flexo" Socket Pull).
PHELPS MFG. CO., Detroit, Mich.
RITTENHOUSE CO., A. E., Honeoye Falls, N. Y., "Easylite."
Barry Mfg. Co., Boston, Mass.
Empire Engineering & Supply Co., New York.
Premier Novelty Co., Chicago, Ill. ("Just Pull" Socket Pull).

AUTOGRAPHIC RECORDERS.
See Instruments, Recording.

AUTOMATIC SWITCHES.
See Switches, Remote Control; also Switches, Time.

AUTOMOBILE STARTING AND LIGHTING.—See Systems, Auto

AUTOMOBILES, Electric.

American Elec. Car Co., Saginaw, Mich., "Argo," "Broc," "Boland-Grannis."
Anderson Elec. Car Co., Detroit, Mich., "Detroit Electric."
Atlantic Vehicle Co., Newark, N. J.
Atlas Car & Mfg. Co., Cleveland, O. (Trucks).
Automatic Transportation Co., Buffalo N. Y. (Baggage Trucks).
Bailey & Co., Amesbury, Mass.
Baker Motor Vehicle Co., Cleveland.
Beaver Motor Truck Co., Portland, Ore.
Buffalo Elec. Vehicle Co., Buffalo.
Capitol Truck Co., Denver, Colo.
Century Elec. Car Co., Detroit, Mich.
Champion Wagon Co., Oswego, N. Y. (Commercial Vehicles).
Chase Motor Truck Co., Syracuse, N. Y. (Repair Wagons).
Cleveland Galion Motor Truck Co., Cleveland, O.
Columbian Elec. Vehicle Co., Detroit.
Columbus Buggy Co., Columbus, O.
Commercial Truck Co. of Am., Phila.
Couple-Gear Co., Grand Rapids, Mich. (Commercial Vehicles).
Cowan Truck Co., Holyoke, Mass. (Trucks).
Cyco-Electric Car Co., New York.

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Established 1892

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Vol. XVII NEW YORK, JUNE, 1915 No. 6

The continued output from electrical manufacturers in the shape of new devices, such as fittings, fixtures, and lighting, heating, and power apparatus, indicates a healthy state of trade. In this issue we publish over 20 pages of such devices, among them many devices of a novel nature. In another part of this issue, we publish a large number of inquiries from abroad for American made electrical products. In one part we tell the industry of the many new things that have just come on the market; in another part we tell this industry what prospective foreign customers are looking for. There is a wealth of valuable trade suggestions in these two departments alone. Our readers are urged to give them careful reading.

Contractors and dealers in electrical supplies in New York are profiting by the new rates for incandescent lighting, which went into effect last month. As announced, the lighting companies' retail customers have the option of paying 8c. a kilowatt hour and furnishing their own lamps, or 8½c. a kilowatt hour, letting the lighting company furnish the lamps. Anticipating that many of the consumers would elect the 8c. rate and go shopping for lamps, a number of electrical contractors and dealers in hardware and household goods have taken on full lines of these lamps as ordinarily used for domestic purposes. They report many inquiries and a constant increase in sales. Lamp manufacturers, on the other hand, report less orders in bulk from the lighting companies with a corresponding increased number of order in small quantities from the many new dealers.

So universal and insistent is the demand for electrically operated devices of one kind or another, even in remote country districts, that there is unusual activity in that part of the field devoted to the building of small lighting plants. These plants are reasonable in price, easy to operate, readily installed, and give a highly satisfactory return for the amount of attention bestowed upon them. The interest taken by the public in these plants is so far-reaching that a publisher of practical books has just brought out an entertaining and informing volume that seeks to give all the information needed to prospective buyers of such plants.

What men of military training would call a salient, has been effected by one of the large middle-west electrical supply houses in the way of a thrust into the field of trade heretofore largely given over to another, and, in a measure, unrelated industry. By way of calling attention of the industry to its adoption of new tactics to meet changing trade conditions, this jobber is now distributing its annual catalogues in two sections. One section contains data about devices that will interest the ordinary electrical supply house; the supplementary catalogue will interest hardware houses and large garages that handle electrical accessories used on automobiles.

Last month was notable for the number of medals presented to men whose work in the electrical arts and sciences has made their names household words. These men are Bell and Edison. The Civic Forum pinned its "distinguished public service" medal on Edison, the Franklin Institute following suit with the Franklin medal for "signal and eminent service in science." The American Institute decorated Bell with the Edison medal "for meritorious achievement in the invention of the telephone." Heretofore we have been famous among foreigners as a nation that submits propositions, appoints committees, and passes resolutions. Later on, maybe we will take rank as a nation that also compels seemingly modest and shrinking inventors to accept medals for doing well what they like to do. In the medal presentation pastime thus far everybody appears to have enjoyed the function except the recipients. Neither Bell nor Edison takes kindly to presentations of this sort. If such medals must be given, we opine that such men as Bell and Edison would rather accept them by proxy. They prefer the laboratory to the limelight.

Elsewhere in this issue we show a novel and new device in the form of a stop-watch for keeping tabs on different time-consuming jobs. Manufacturers who have to speed-up on output and shave close to the market on cost per unit output will find it worth while to look into the merits of this device. Its use might make for efficiency, if that particular form of efficiency is what the manufacturer is looking for. There are those who contend, however, that though extra efficiency can be had by such means, it comes at the expense of what is sometimes far more efficacious than efficiency, and that is loyalty and the absence of captious discontent.

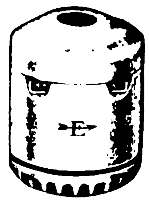
Again we are on the threshold of the biggest annual convention in the electrical industry. The National Electric Light Association meets this month in far away San Francisco. Those who know say society conventions of any kind are always worth while when there is free and candid exchange of ideas, accurate information, and experience with men and machinery. This particular association is a model of usefulness in this respect. Other associations we have known of hold yearly conventions at a time when the candid exchange of information and experience seems to have gone junketing elsewhere. At such conventions delegates entertain each other with old wives' tales to the tune of corporation time and corporation cigars.

NEW PRODUCTS

THIS DEPARTMENT IS DEVOTED EXCLUSIVELY TO NEW GOODS, AND IS A COMPLETE MONTHLY RECORD OF PROGRESS

Arrow Receptacle for Metal Signs and Outlet Boxes

The Arrow Electric Co., of Hartford, Conn., announces that it is ready to supply the trade with the new sign receptacle shown in the accompanying cut. It has the following features: the button on the back is readily removed without tools; replacing the button after the connection is made, completely encloses the contacts; the distance from the gasket to binding screw is 1 inch. The hole required for this receptacle is 1½ inches in diameter.



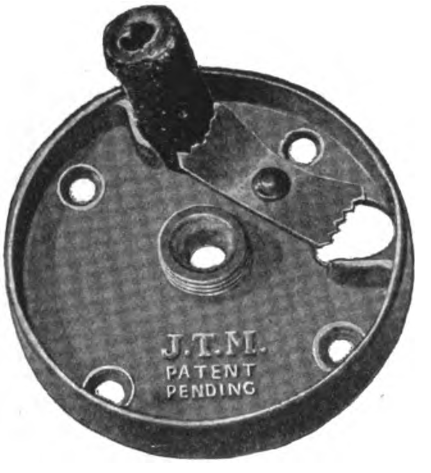
Receptacle for metal signs and outlet boxes. The Arrow Electric Co., Hartford, Conn.

The screw shell is made of a copper alloy, the physical properties of which have been especially chosen to withstand the deterioration and corrosion due to weather exposure. All screw shells are reinforced by washers under the heads oi the retaining screws. The screw shells may be removed from the front, without disturbing the sign. The binding screws are spun over to prevent them from falling out.

Meleady Loom Box

This loom box has been approved by the Underwriters. It is made in four styles by The Sterling Foundry & Machine Co., 50 Hartford street, Newark, N. J.

As the cut shows, the box combines, in one unit, a box, a fixture stud, or collar, and a simple automatic means of gripping the loom. The wall of the box is carried up to a uniform height, so that the plaster can be brought flush with the top of the box. In wiring old houses this feature also enables one to make a very neat job by cutting a circle of plaster out down to the lath and inserting the box. On the straight electric box a countersunk hole extends through the threaded stud, adapting the box for use with a toggle bolt or an ordinary wood screw.



Meleady loom box. The Sterling Foundry & Machine Co., 50 Hartford street, Newark, N. J.

This box is not intended for a three-handed man, but for an ordinary workman who can use one hand for the loom, the other for the box. It was designed by a skilful and experienced electrician.

Freeman Sockets and Receptacles

In addition to the several fittings shown on page 15 of the Electrical Record for May, 1915, the E. H. Freeman Electric Co., 803 East State street, Trenton, N. J., is offering the trade the new ones shown in the annexed cuts.

Fig. 1 shows a new type of socket with shadeholder attached. These holders are spun on the socket shell. Being of heavy metal with three supporting arms, they are said to make a fitting which will carry a heavy shade with a greater degree of safety than the independently attached holder.

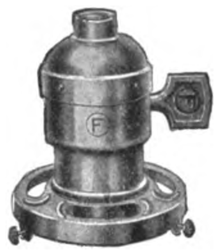


Fig. 1.

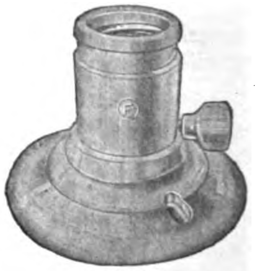


Fig. 2.

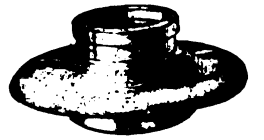


Fig. 3.

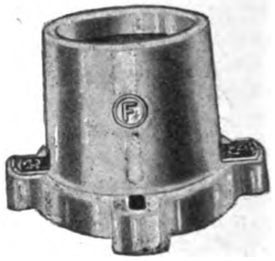


Fig. 4.

New line of sockets and receptacles. E. H. Freeman Electric Co., 803 East State street, Trenton, N. J.

Fig. 2 shows an outlet box porcelain socket which is interchangeable with Freeman key and keyless type porcelain sockets.

Fig. 3 shows a porcelain outlet box receptacle made for 3 or 3¼-inch and 4-inch boxes. The cut shows an open connective type in which the back of the receptacle extends into the box only ⅜ of an inch, allowing its use in the shallowest boxes. The binding screws are set at an angle and both face the same way, making quick and easy wiring possible.

Fig. 4 shows a mogul base, cleat receptacle. This is adapted for open wiring and is made with four lugs or feet under the projecting ears, which allows for air space between the body of the receptacle and the surface to which it is attached.

Fig. 5 shows a porcelain receptacle designed for use with large enameled reflectors of the same size and type as those used with the mogul sockets. The receptacle is furnished with a brass bushing and locknut for direct attachment to the shade. The receptacle having slots opposite the binding screws, is easily wired, and the cap having two lugs for fitting these slots when it is attached to the receptacle, leaves the contacts entirely enclosed.

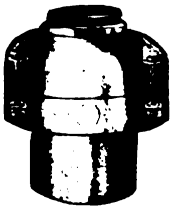


Fig. 5.

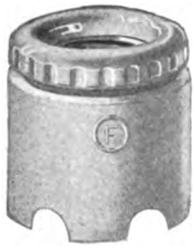


Fig. 6.

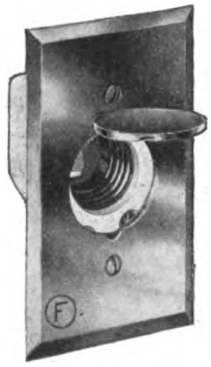


Fig. 7.

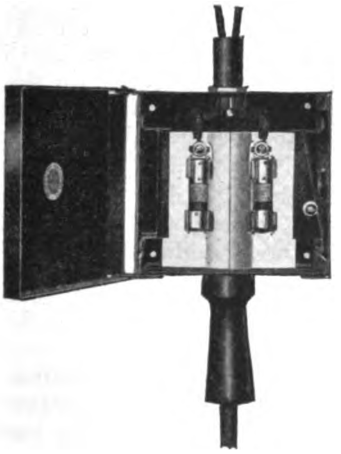
New line of sockets and receptacles. E. H. Freeman Electric Co., 803 East State street, Trenton, N. J.

The receptacle shown in Fig. 6 is so designed that it is not necessary to use any gaskets, thereby preventing drying or rotting out. This receptacle is also particularly adapted to ceiling lights, as it is impossible to turn off the back of the receptacle when renewing the lamp. As it cannot come loose, the danger of short circuiting by the screw shell coming in contact with the fixture is eliminated.

A flush receptacle, screw type, is shown in Fig. 7. In this fitting the binding post is of the flush switch type and is seated in a deep pocket; this feature, together with the independence of the binding screw for aligning purposes, prevents its turning when being wired. The porcelain is designed to be easily centered in the narrowest box. The screw shell is reinforced with a heavy brass yoke. The center contact is of phosphor-bronze.

Detroit Fused Plug Receptacle

"Square D" fused receptacles, as these are called, are designed primarily to increase the field of activity and efficiency of portable electrical units in industrial plants and wherever it is more economical to move the units than the materials. The receptacle is made of 16 Ga. sheet steel with corners electrically welded. Fuses and terminals are mounted on two porcelains held in place within the box by a steel wedge at the side. In case of accident or breakage, the porcelains may be easily removed and quickly replaced, preventing any undue loss from delay to the work in hand.



Square D fused plug receptacle, interior view. Detroit Fuse & Mfg. Co., 1400 Rivard street, Detroit, Mich.

The end plate at bottom is also separate and removable, another convenient feature.

The receptacle may be fused for any portable unit up to 30 amperes, 250 volts capacity.

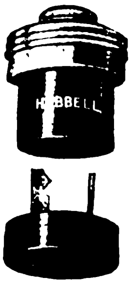
After properly fusing the equipment, the receptacle may be sealed shut, thus preventing over-fusing of the circuit and consequent damage to the portable units.

In case of emergency when the controlling switch is at a distance the receptacle is both a convenience and safeguard as the circuit controlling the equipment affected may be quickly opened by pulling the plug. This device is now being marketed by the Detroit Fuse & Mfg. Co., 1400 Rivard street, Detroit, Mich.

Hubbell Polarized Motor Plug and Indicating Heater Receptacle

Harvey Hubbell, Inc., Bridgeport, Conn., is marketing this month two more useful electrical fittings in the shape of a polarized motor plug and an indicating heater receptacle. Both fittings are shown herewith.

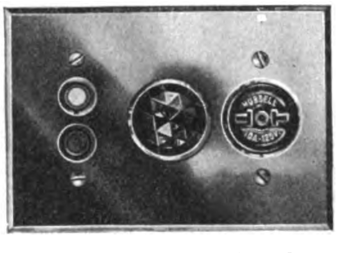
The composition cap with knife blade contacts in the polarized motor plug is designed to be permanently attached to electrically operated machines.



Hubbell polarized motor plug. Harvey Hubbell, Inc., Bridgeport, Conn.

To facilitate the use of this plug in connection with portable machines, the base may be attached to a leader and connections made with any variety of machines equipped with this polarized cap. The polarity arrangement insures proper connection at all times.

The body of the portable base is made of composition and the end brass covered, making it sturdy and able to withstand hard usage.



Indicating heater receptacle. Harvey Hubbell, Inc., Bridgeport, Conn.

The indicating heater receptacle is furnished ready wired, complete with switch and plug receptacle. The plug is equipped with the new Hubbell "T" slot contacts, permitting the interchange of seventeen different types of caps.

This device is rated at 10 amperes, 125 volts. The four supporting screw holes are spaced 3 9/32 inch on centers vertically and 3⅝ inch on centers horizontally. It is designed for use with three-gang wall boxes.

Benjamin Wiring Devices

The Benjamin Electric Mfg. Co., 120-128 South Sangamon street, Chicago, Ill., is offering the trade the several new wiring devices shown in the accompanying illustrations. The line includes five devices, as follows:

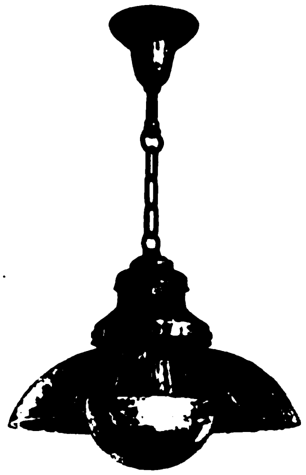
The Benjamin current tap socket is new, but it is an adaptation of two old ideas—the socket and the current tap. The combination appears desirable. Primarily the device is a fixture socket of the accepted type, but with the added convenience of a plug attachment. This socket is designed to operate electric appliances from a fixture without removing the lamp or doing without a light.

The "Unit-shell" socket shown in the cut in two styles is another Benjamin departure from the rut of two-piece shells. One style has the regular form of bead at the bottom as a bearing for the standard shade holder; the other style is expanded at the lower part for a threaded portion, which accommodates any one of the Benco holders, taking glassware with fitters ranging from 2¼ to 6 inches. This socket is intended to be used on interior fixture installations.

Current tap socket.

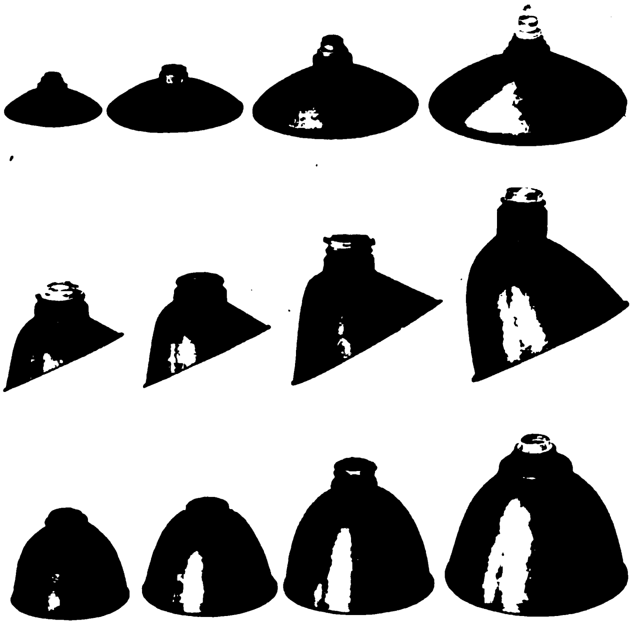
Unit shell socket.

Copper cap porcelain socket.


Direct-indirect lighting unit.

New line of wiring devices. Benjamin Electric Mfg. Co., 120-128 South Sangamon street, Chicago, Ill.

The "Copper Cap" porcelain socket is an important advance in "weatherproof" porcelain socket construction. Besides its wearing qualities under adverse conditions, this socket has added advantages in the Benjamin lamp grip, a spring means securing the lamp, and in that the device is furnished with caps tapped in four sizes, accommodating stems ranging from ⅛ inch to ½ inch iron pipe sizes. Two styles of this socket are offered, one plain, and the other beaded to furnish support for shade holder.


Shade holder type reflectors. Benjamin Electric Mfg. Co., 120-128 South Sangamon street, Chicago, Ill.

The Benjamin direct-indirect lighting unit is a lighting fixture of the commonly called "semi-indirect" type. In this unit the eye is shielded from lamp glare by the 8-inch opal glass dish suspended beneath the lamp, while the 16-inch reflector above reflects and re-reflects the light stream to the plane of working usefulness.

The Benjamin "Shade Holder Type" reflectors are intended to combine efficiency with attractive outline. The holders are "built in" devices whereby the reflectors may be quickly attached to any socket, brass shell, porcelain, or the Benco. There is a full assortment of styles, and the finishes are in green or white enamel, or aluminized steel.

Dolph Chinalak and Universalak

John C. Dolph Co., of Newark, N. J., has recently developed a medium priced varnish called "Chinalak." It is said to be free from any trace of corrosive element.

On armature coils this new material will, it is claimed, bake in about six hours or air dry in twelve hours, giving protection from oil and water. The slowness with which it ages combined with its exception elasticity, makes it possible for the manufacturer to build up and stock an unlimited number of clear coils without fear of their becoming too brittle to assemble.

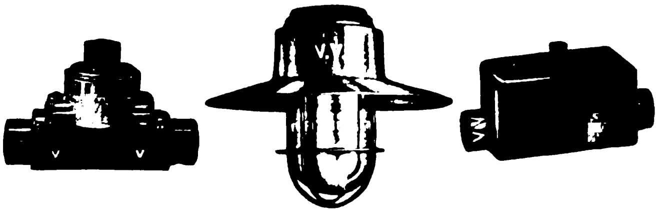
Chinalak can also be used to insulate and waterproof enameled wire coils without danger to the enamel even though wet varnish still remains in the coil because of insufficient baking. Tests of this material on cloth show a breakdown well above 1,300 volts per mil.

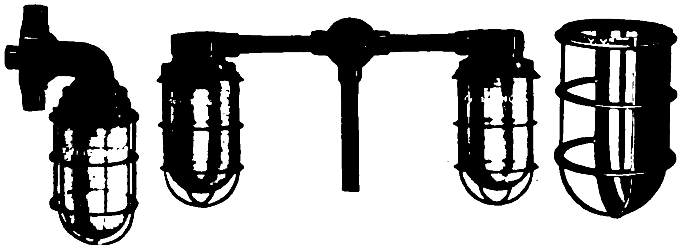
"Universalak" is the name of another preserving and insulating compound now being marketed by this company. It is intended to be used on battery boxes and leads—on any place in the battery room that needs protection from acid and acid fumes. It can also be used on junction, cutout, and switch boxes, overhead and underground cables, as a preventive to effects produced by moisture and weathering. It will supply a waterproof finishing coat to armature and field coils.

New "V. V." Fittings

The "V. V." Fittings Co., 1910 North 6th street, Philadelphia, Pa., is now offering the trade a brand new line of fittings, some of which are shown in the accompanying illustrations.

Among these fittings is a weatherproof sign fitting for outside work. The wire outlets are set at an angle of 45 degrees, and a straight pull can be put on the wires when connecting up the fitting. It is made in all sizes from ½ in. to 4 in. inclusive. It will wire outlets having from 1 to 6 wires. Among the other new fittings are:

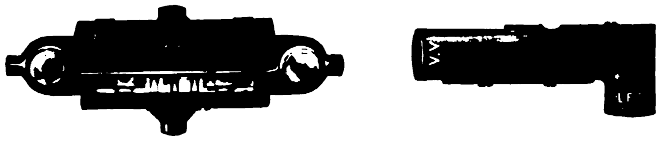




Straight-through, dead-end, and "T" fittings with receptacles, snap switches, and porcelain nipple covers. In each case the covers with attachments are interchangeable on the three types.

Newly designed "LFB" and "LW" fittings, both of which allow a straight pull on the wires.

To the vaporproof line of type 5 series fittings there has been added an "L" attachment, making it possible to place the vaporproof fitting at many different angles. Another addition to the vaporproof line is a twin fitting, consisting of standard vaporproof parts, the gaskets being of leather soaked in oil. These vaporproof fittings are especially adapted for damp and dusty places.

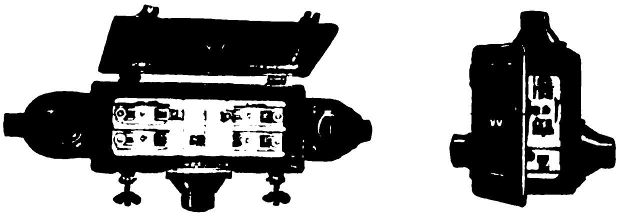


Perhaps the most interesting addition to the type 5 series V. V. line is the new V. V.-516 no-splice block with rosette cover and no-splice block with No. 613 V. V. receptacle. The no-splice block is made to eliminate the splicing of wires in conduit fittings and do away with soldering, rubbering, and taping splices and on the other hand making a neat, compact installation.

Another interesting addition covers the 45 degree angle piece for No. 1 size, type 5 series "V. V." fittings. This angle piece will fit on the various No. 1 size type 5 series fittings and can be placed in position on the fitting.

Two new No. 2 size, type 5 series fittings are known as the "5-U," "5-Y" fittings. These are made to take all No. 2 size, type 5 series covers, porcelain and iron, including Hubbell cover, concealed receptacle cover, and various sizes of nipple covers.

Type "P" fittings have been altered to take various covers, such as single and double push button switches, rotary switch, Hubbell plug receptacles, and screw plug receptacles.



Thirteen varieties of the many new fittings, made by V. V. Fittings Co., 1910 North Sixth street, Philadelphia, Pa.

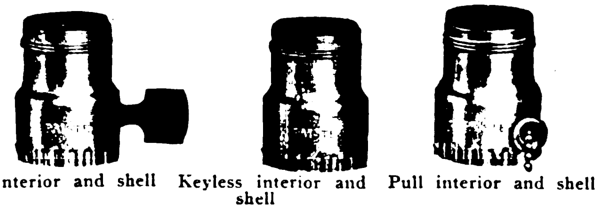
New type "Y" series fittings are made in various sizes, so as to take cutouts from 30 amperes to 100 amperes capacity, and 2 or 3 wires. They will take cutouts made by various manufacturers, leaving ample room for wiring connections.

Type "Z" series fittings cover a line of boxes arranged to take cutouts, and having an extension for snap switches to control the outlets of the cutouts.

Type "ZW" fittings are made watertight and dustproof. They guard against mechanical injuries and prevent operators from coming in contact with any live metal parts. The boxes are arranged with outlets on all sides and will take single and double branch, new code or plug fused cutouts, and also 5-ampere snap switches.

New Way of Selling Sockets

Paiste Sockets, for which the Hart & Hegeman Mfg. Co., Hartford, Conn., are selling agents, can now be bought unassembled. Each cap, base, and shell with interior is boxed separately and can be bought by itself.



Key interior and shell Keyless interior and shell Pull interior and shell

⅛-inch cap ¼-inch cap ⅜-inch cap

Plain wall base Angle wall base Small covered wall base

Interchangeable fittings. Hart & Hegeman Mfg. Co., Hartford, Conn.

This enables dealers and users to have a complete stock with a small investment. From a stock of a few parts, four to five times as many different types of sockets can be assembled.

Because of the small number of different pieces to be handled, this way of buying also makes work very easy for the stock keeper, both in keeping his stock in shape and complete and in picking out the material that is required on a job.

To make ordering easy, each part is designated by a letter or number. An illustrated sheet is furnished showing the different parts, with descriptions and prices.

A few of these are shown below. The numbers and letters under the illustration show standard package, schedule and list price. In ordering assembled sockets, the letter and number of the desired cap and shell are combined, as an "⅛-in. key socket" is ordered as "A-50."

Dongan Junior Bell Ringing Transformer

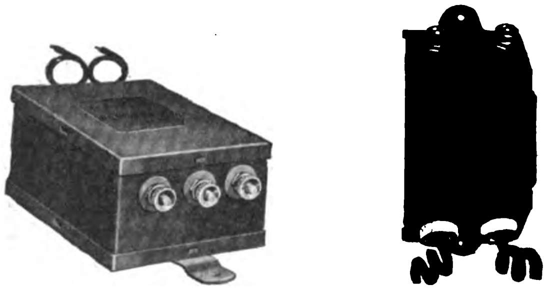
A new "Junior" bell ringing transformer has just been brought out by the Dongan Electric Mfg. Co., 741 Franklin street, Detroit, Mich. This type has been developed to meet the demand for ordinary residence installations, containing two or three 2½ inch or 3 inch bells. The case is of cast iron, and unbreakable. The coils are imbedded in transformer wax, insuring mechanical as well as electrical protection. The entire transformer can be entirely submerged in water, without impairing its operating characteristics in any way.

Dongan Junior bell ringing transformer. Dongan Electric Mfg. Co., 741 Franklin street, Detroit, Mich.

These transformers are approved by the fire underwriters. Standard windings are for 110 volts, 40-60 cycle; 220-volt or 25-cycle coils can be furnished when desired.

Jefferson Bell Ringing Transformers

The recently organized Jefferson Electric Mfg. Co., 547 West Harrison street, Chicago, is offering the trade the brand new line of bell ringing transformers, shown in the accompanying cuts. These bell ringing transformers are designed to be connected to the ordinary alternating lighting circuit. They step-down the voltage to operate all kinds of bells, buzzers, door openers, annunciators, and other signaling devices that require a low electrical pressure.



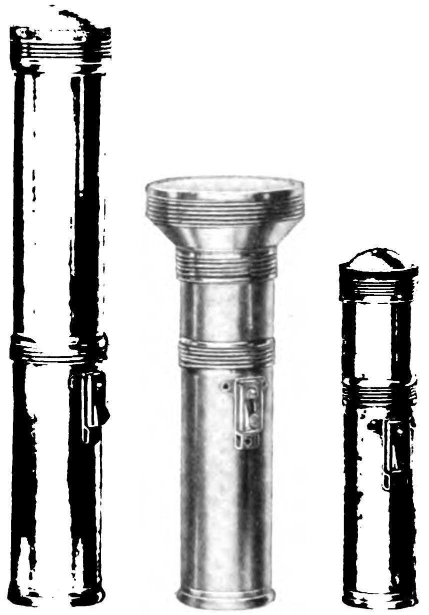
Jefferson bell ringing transformers. Jefferson Electric Mfg. Co., 547 West Harrison street, Chicago, Ill.

These devices are made in four types. The "Junior" bell ringer is designed for all kinds of light signal work. The type B bell ringer has a capacity of 25 watts and is designed for heavier signal work. It produces three secondary voltages—6, 14, and 20. The heavy duty B bell ringer has a capacity of 75 watts. It also produces 6, 14, and 20 volts on the secondary. The type C bell ringer has a capacity of 125 watts and produces four secondary pressures—6, 12, 18, and 24 volts. The "Junior" weighs 2½ lb., the type B, 4 lb., the heavy duty type B, 7½ lb., and the type C, 9 lb.

These are said to be the only transformers on the market that will perform their various duties without registering on an ordinary wattmeter.

Metal Tubular "Kwik-Lites"

Metal tubular "Kwik-lites" cases are drawn from solid sheet brass. The lower piece telescopes the upper near the center. This insures maximum strength, and permits engaging the screw threads without effort. The lens is secured by a separate screw end ring. This allows a broken lens to be replaced without procuring an entire new head. Five different sizes are made, and each is offered in the following finishes: Heavy polished nickel, gun metal, and statuary bronze. They are offered to the trade by the Usona Mfg. Co., Inc., 1 Hudson street, New York, and 307 S. St. Clair street, Toledo, Ohio.



Metal tubular "Kwik-lites." Usona Mfg. Co., Inc., 1 Hudson street, New York, and 307 S. St. Clair street, Toledo, Ohio.

Presto Electric Two-Cell Hand Lamp

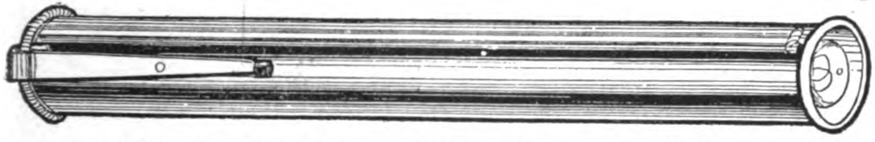
In addition to the one-cell hand lamp shown on page 25 of the Electrical Record for January, 1915, the Metal Specialties Mfg. Co., Inc., 738 W. Monroe street, Chicago, is now marketing the two-cell hand lamp shown in the annexed illustration. This lamp is equipped with a 3-volt bulb and a 3 in. bull's-eye

Two-cell hand lamp. Metal Specialties Mfg. Co., Inc., 738 West Monroe street, Chicago, Ill.

lense. Two ordinary No. 6 dry cell batteries furnish the source of energy. This lamp stands 7 in. high and is finished in black enamel. Like other devices of this kind, it will burn intermittently or continuously at the will of the operator. The light is thrown on and off by a simple switch. As shown in the cut, the bulb can be rotated so as to throw light in any direction. The switch is located at the back of the reflector. This lamp is carried by a handle that automatically drops to the back of the lamp when it is not in use.

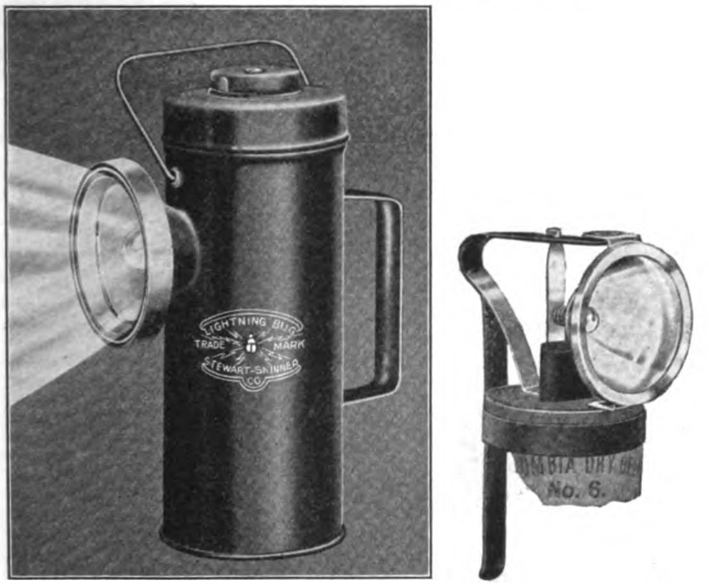
Stik-O-Lite

The Stik-O-Lite is a new form of pocket flashlight recently put on the market by the Import Sales Co., 19 East 21st street, New York. It is equipped with a Diamond lamp and Roka brand batteries, but will take any standard size lamp and standard dry battery. This flashlight is open at both ends, so that the battery can be inserted or pushed out either way. It is a uniform thickness throughout. The light is turned on and off by means of the clip, which also acts as a holder to keep the lamp from slipping out of the pocket.


Stik-O-Lite. Import Sales Co., 19 East 21st street, New York.

"Lightning Bug" Lantern and "Meteor" Attachment

The Stewart-Skinner Co., 4 Cherry street, Worcester, Mass., is now offering the trade the "Lightning Bug" electric lantern and the "Meteor" electric lantern attachment shown in the accompanying cuts. The company says that the light from the lantern enables one to read ordinary print at a distance of 50 feet. This lantern is built for continuous burning. It is equipped with a tungsten lamp and a new and scientifically designed reflector. The battery used is a regular No. 6 dry cell.



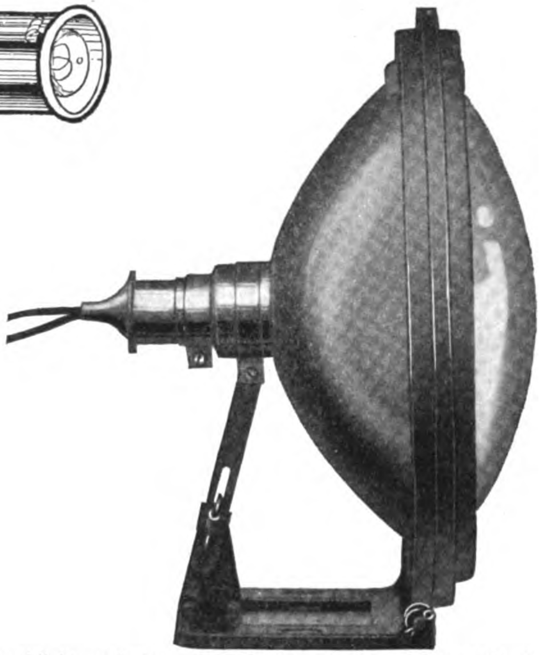
"Lightning Bug" electric lantern and meter lantern attachment. Stewart-Skinner Co., 4 Cherry street, Worcester, Mass.

In the "Meteor" electric lantern attachment, the company is marketing a device which is stated to produce the same results in a more inexpensive form. It is claimed that this type of lantern, which can be quickly attached to any No. 6 dry cell, is designed to meet the demand for an indoor lantern or portable house lamp.

General Electric Flood-Light Projector

This new flood-light projector has been designed by the General Electric Co., Schenectady, N. Y., for illuminating building exteriors and advertising matter at night.

It consists of a polished aluminum parabolic reflector, 16 inches in diameter and mounted in an iron frame. The front is covered with curved heat resisting glass. This is clamped to the reflector frame and packed so that the whole unit is waterproofed. All exposed parts are either of non-corroding alloy or weatherproof coated. The projector itself is ventilated by a current of cool air enters near the base of the lamp, circulates around the stem and bulb, and passes out at the front top edge of the reflector.

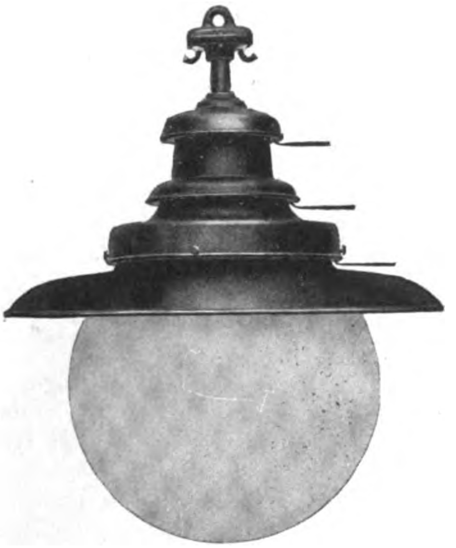

Flood-light projector. General Electric Co., Schenectady, N. Y.

The installation of the outfit is simple. The most convenient location within a distance of from 25 to 500 feet from the surface to be lighted is selected and the projector bolted or screwed in place. It may be located on the roof of a building, the side of a wall, or mounted on brackets on a telegraph pole. The base of the projector has slotted bolt-holes, which permit of a slight adjustment before the final location is made. Since the power consumed by the lamp is only 500 watts at 110 volts, the projector may be connected to an ordinary lamp circuit. The entire outfit weighs about 30 pounds. The lamp most commonly used is a 500-watt focus-type mazda "C" lamp in a "G-40" bulb with a mogul base.

Herwig Air Cooled "Ventilite" Unit

To meet the growing demand for a substantial holder for the type C lamps, a new line of cast metal units has just been developed by the Herwig Art Shade & Lamp Co., 2140 N. Halsted street, Chicago, Ill.

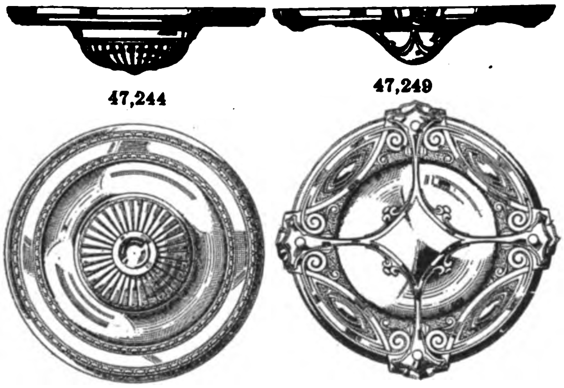
As shown in the cut, the cap of the holder is a removable piece tapped for half-inch conduit. It eliminates the expense of a socket with a cap, the socket being attached to the inside of the holder cap with screws. The cap of the holder is held in place by lugs and three screws, which permit the removal of the lower part of the holder and allow ready access to the socket at time of installation or later should the socket become defective and need to be replaced. The triple ventilating system allows free circulation of air, adding to the life of the lamp.


Air-Cooled Ventilite unit. Herwig Art Shade & Lamp Co., 2140 North Halsted street, Chicago, Ill.

The unit construction permits the interchanging of parts. In cases where a ball is not required the hood reflector may be attached directly to the body portion of the holder, making it the factory reflector type of unit. Different size holders may be interchanged at any time after installation without rewiring. The units are made of cast metal, are finished in black fired enamel, and may be had in 6, 7, 8, 9, and 10 inch sizes.

Friedley-Voshardt Fixture Shower Pans

The accompanying cuts show two ornamental shower pans for lighting fixtures, which have recently been brought out by the Friedley-Voshardt Co., 733 South Halsted street, Chicago. These shower pans, in connection with the other lighting fixture parts made by this company, are used in making up different kinds of fixtures. The way in which these parts are combined will depend, of course, on the place where the fixtures are to be used and the taste and fancy of the contractor who does the assembling.

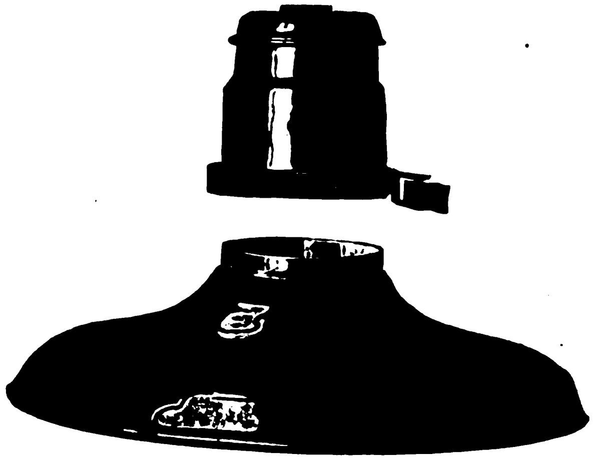


Fixture shower pans. Friedley-Voshardt Co., 733 South Halsted street, Chicago, Ill.

Economy Reflector Units

Economy reflector units are designed for use in connection with multiple mazda incandescent lamps. Their chief feature is the readiness with which they can be interchanged. One socket holder, so designed as to be well ventilated, assembled with the different required reflectors, glass holders or both, constitutes a complete line of all the larger units required for industrial illumination. This also includes a great variety of both outdoor and indoor service, not included within the range of industrial service.

The socket holder incorporates a patented positioning device, on which is mounted either a mogul or medium base socket. The same support applies to either, and it is capable of locating upward or downward at various points. Each unit in this manner is adaptable for the use of lamps of different capacity, with the filament centers of each properly located, with reference to the reflector. In this way, the maximum efficiency of illumination is secured for either intensive or extensive distribution of light emanating from any lamp.


Economy reflector units. Electric Devices Co., Cleveland, Ohio.

By the use of an adjustable latch the time to install a glass ball or remove it for cleaning is greatly reduced. A simple movement of the latch either holds in position or releases the glassware. This feature also includes an adjustment to provide for variations of glassware and is capable of an optionally tight or loose fit within the range of any reasonable variation.

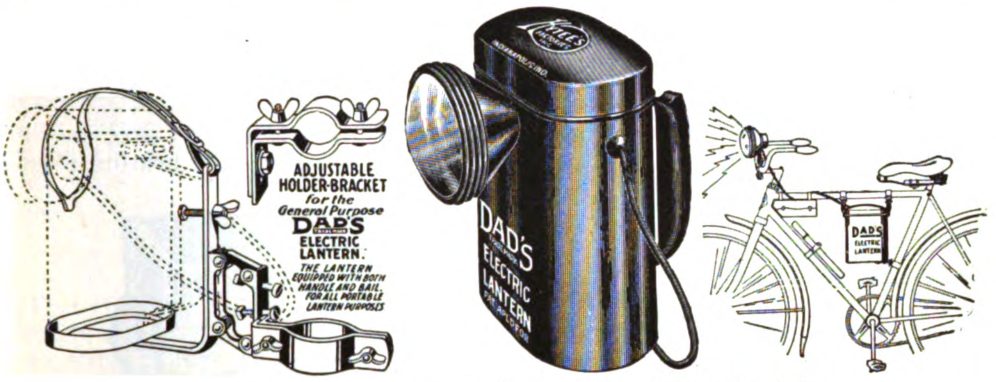
Bryant Ceiling and Wall Receptacle

The Bryant Electric Co., of Bridgeport, Conn., has brought out a new ceiling and wall receptacle with pull chain for concealed wiring, designated as their catalog No. 4104. This is designed especially for a 4-inch outlet box, but may be attached also to 3¼-inch boxes. In addition, it can be used for ordinary ceiling work because of its flat back. This device measures 4⅝ inches outside by only 2 inches deep. Holes for supporting screws are spaced on 3½ inches and 2¾ inches on centers. Binding screws are provided to which "loop" wires may be readily attached.

Ceiling and wall receptacle with pull chain attachment. Bryant Electric Co., Bridgeport, Conn.

Dad's Electric Lantern

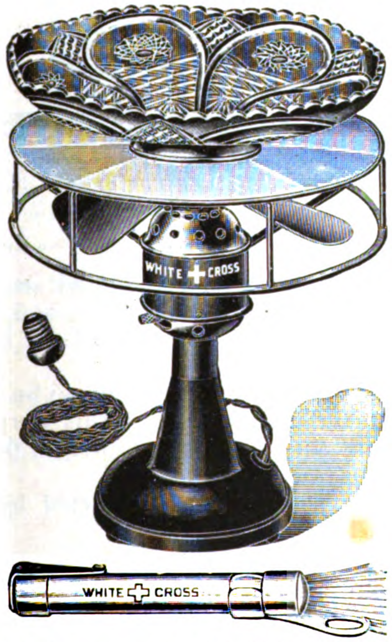
Among the many novel small lighting units that have recently come into the market is the Dad's lantern made by Hytee's Factories, Inc., Indianapolis, Ind. It draws energy from the two dry cells with which it is regularly equipped, and distributes the rays of light from a mazda tipless bulb through a 3-inch lens. It is fitted with a double interlocking switch which keeps the light from flickering. The holder is of steel coated inside and out with high quality baked-in French enamel. The handle, bail, lens cap, and reflector housing are similarly treated. The entire case and fittings are said to be rust proof. The dimensions of this lantern are: 7½ inches high, 5¼ inches wide, 2¾ inches thick. The makers say that this lantern is the embodiment of "canned daylight."


ADJUSTABLE HOLDER-BRACKET for the General Purpose DADS ELECTRIC LANTERN.
THE LANTERN EQUIPPED WITH BOTH HANDLE AND BAIL FOR ALL PORTABLE LANTERN PURPOSES
DAD'S ELECTRIC LANTERN
DADS ELECTRIC LANTERN

Dad's electric lantern. Hytee's Factories, Inc., Indianapolis, Ind.

White Cross Table Fan and Vest Pocket Lamp

This fan is for use on table as a center piece. It is said to give a breeze which is strong enough to be comfortable, but not too strong to be annoying. It operates on either direct or alternating current, any frequency. It can be furnished for any desired voltage from 100 to 220. It is equipped with a three-speed regulating device. The entire fan is finished in nickel and brass. It is provided with a glass bowl on top, which can be removed at will. The fan comes complete with an 8-foot cord and plug. The base is provided with rubber feet. The fan is 10½ inches high and 9½ inches wide over all.



White Cross table fan and vest pocket lamp. Lindstrom, Smith Co., 1100 South Wabash avenue, Chicago, Ill.

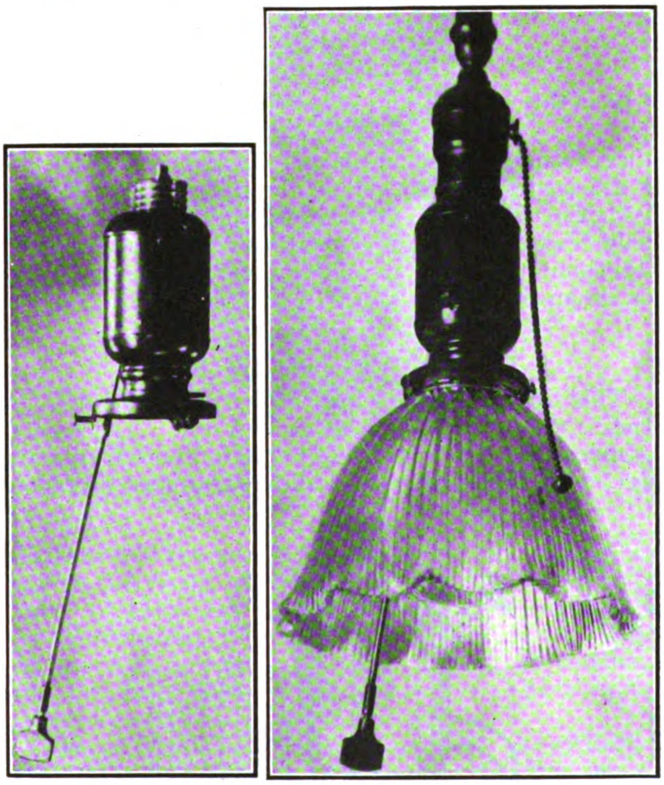
The vest pocket lamp is no larger than a large pencil. The switch of the flashlight is used as a clamp to prevent it from slipping out of the pocket. It is designed for use by doctors, dentists, and nurses. The battery will give continuous light for a long time and at least one thousand flashes. The tongue depressor can be easily removed and carried in the instrument case. It can be slipped on the lamp in a moment.

It is 5 inches long and ⅝ inch in diameter. The case and tongue depressor are heavily nickel-plated and highly polished.

Both these devices are made by the Lindstrom, Smith Co., 1100 S. Wabash avenue, Chicago, Ill.

Eaco Twin-lo Reducer

Under this name the Tlectrical Auxiliaries Co., 1842 Morse avenue, Chicago, Ill., is marketing a device for dimming an incandescent lamp. It is a combination lamp socket attachment and dimmer. It consists of an inductance coil which may be connected in series, wholly or in part, with the lamp or similar load. During full illumination, that is, normal operation, the inductance is short-circuited upon itself, and thus not subject to losses of energy; while for conditions of reduced illumination a part of the whole of the inductance is connected in series with the lamp filament.



"Eaco Turn-lo" reducer. Electrical Auxiliaries Co., 1842 Morse avenue, Chicago, Ill.

There are three essential parts: the winding, the magnetic circuit, and the switch. The coil consists of a number of turns of wire from which one or more taps are taken off. The number of turns used in this coil is relatively low on account of the arrangement of the magnetic circuit.

The magnetic circuit consists of a central cylindrical core and an outer shell of magnetic material, both wound in the form of a spiral, with end pieces tightly clamped at each end. Between the two spiral cores is placed the solenoid winding. Insulation is inserted between the end pieces and the main core, thus introducing an air gap at each end of the magnetic circuit. An important feature of this air gap is that it enables the inductance of the device to be adjusted for any value that may be required within reason. The switch knob is so located that it can be reached easily and quickly.

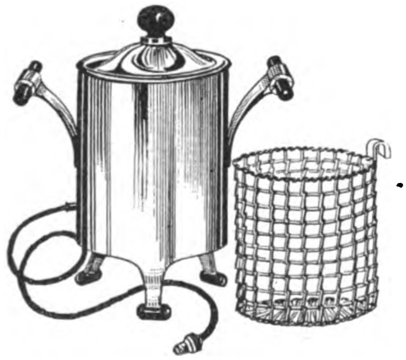
Colonial Terminal Block

The Colonial terminal block is used to connect lamp post circuits to underground feeders. This block has proved successful for this purpose on both series and multiple circuits. The use of this device is said to save time, trouble, space, and labor. It measures 5¼ x 3⅝ x 2¼ inches. It is made by The Colonial Sign & Insulator Co., of Akron, Ohio. The makers claim it is the only device on the market that insures safe and economical connection between underground feeders and lamps on ornamental standards.

Terminal block for connecting lamp post circuits to underground feeders. Colonial Sign & Insulator Co., Akron, Ohio.

Dur Eco Electric Egg Boiler

This device is made by the Dur Eco Electric Co., Inc., 136 West 52d street, New York. It is said to possess the novel feature of being immune from damage, even if the current is allowed to stay turned on after the water has boiled away. The heating effect of the current is automatically discontinued by the same event that would otherwise burn out the boiler.



Electric egg boiler. Dur Eco Electric Co., 136 West 52d street, New York.

It is made of heavy metal, nickle-plated and finished with ebonized handles, nob, and feet. It will hold six eggs, and the water is said to be brought to the boiling point within three minutes after the current is turned on. The eggs are placed in the wire woven container shown in the cut.

Rapid Fire Toaster

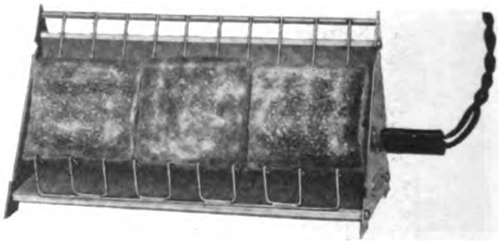
E. W. Manter & Co., 158 Purchase street, Boston, have developed a new toaster that will make four slices of toast per minute.

The wattage on the toaster is only 400, due, it is said to the method of mounting the heating element and a special reflector which projects the heat upward. The top of the toaster is hot while the bottom part is comparatively cool. The top part of the toaster is removable so that the reflector may be polished from time to time to maintain its efficiency. The frame work is assembled by a process known as spot welding, and all the parts are heavily nickel-plated.

Rapid Fire toaster. E. W. Manter & Co., 158 Purchase street, Boston, Mass.

Truitt Heater-Toaster

As implied by the title, this is a combination toasting and warming device. It is made of nckled brass and aluminum, and consists of but few parts. The ends or frame pieces are triangular, being held together by three rods, two of which grip the aluminum reflector. This reflector is designed so as to throw nearly all the heat in one direction and at an angle that utilizes nearly 100 per cent. of the heat rays, in converting bread to toast.



Truitt heater-toaster. Truitt Electric Co., Pomona, California.

In moderate or damp weather it can be used to take the chill off small rooms. For this purpose it consumes only a small amount of energy, 6 amperes at 110 volts, or 660 watts.

This device is now being marketed by the Truitt Electric Co., Pomona, California.

McBride Electric Laying-Off Board

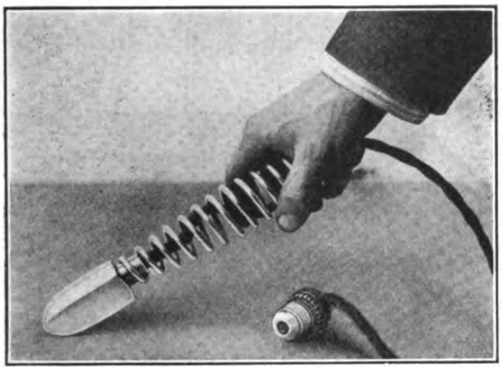
An electrically operated laying-off board has the same sort of interest for glove manufacturers and cleaners that the relaster described and illustrated elsewhere in this department has for manufacturers and dealers in boots and shoes. The relaster, as stated, tones up run-down shoes; the laying-off board gives the finishing touch to gloves—after cleansing it has the same effect on a soiled and wrinkled glove that washing and ironing have on soiled linen.

This board is easily installed, no expert work being required. All that is necessary is to bore a hole in the table top, a trifle larger than the shank of the appliance. Then let the base in and fasten. These boards are wired for 110 volts; boards will be wired for 220 volts on order. Three feet of high-class connecting cord and an electric plug are furnished.

The glove is slipped over the board, the fingers separated by strips of wood, the plug attached to the lighting socket, and the current turned on. Either alternating or direct current will serve. The glove can be left on indefinitely without danger of burning or scorching. This device is made by The C. L. McBride Mfg. Co., Toledo, Ohio.

Fearn Calorel Relaster

This is the name of a novel electrically heated tool recently brought out by the Fearn Co., 206 North Frederick street, Baltimore, Md. It will be found useful by all who make, sell, and repair boots and shoes. Designed to smoothe out wrinkles, creases, and other irregularities in footwear, it will, it is claimed, make crumpled and mussed shoes a sales instead of a bargain counter proposition. By means of it shopworn shoes can be furnished until they are as good as new.



Calorel relaster. Fearn Co., 206 N. Frederick street, Baltimore, Md.

This relaster consists of three parts rigidly fastened together: a polished brass point weighing one pound, a serviceable heating element; and nickel-steel wire handle equipped with 10 feet of flexible cord and a detachable plug. It consumes 80 watts.

Peerless Switch Dial Decade Testing Set

This testing set has just been brought out by the Thompson-Levering Co., 323 Arch street, Philadelphia, Pa.

This set was designed for use by the ordinary workman, and has been so simplified that it does not require any technical education to produce accurate results. The simple circuit design has made it adaptable for all classes of men, from the ordinary lineman to the electrical engineer.

Peerless switch dial decade testing set. Thompson-Levering Co., 323 Arch street, Philadelphia, Pa.

The rheostat consists of four decades of ten coils each, values of units, tens, hundreds and thousands, accurate to 1/10 of 1 per cent. The bridge coils are accurate to 1/20 of 1 per cent.

It has a self-contained, removable galvanometer and also a self-contained battery. Provision is made by means of binding posts to use an outside battery when a higher electromotive force is desired than that given by the cells in the set, which are ample for ordinary testing.

Westinghouse Prepayment Watthour Meter

The Westinghouse Electric & Mfg. Co. has recently added a prepayment feature to its standard line of type OA watthour meters. The type OA prepayment meter is especially useful when supplying current to small consumers as it collects the bill and saves bookkeeping. It is also useful in supplying a shifting population, such as at summer resorts, because it saves following up the consumer to collect the bill.

The prepayment mechanism is arranged to receive twenty-five cent pieces, and not only registers the amount of energy consumed but indicates by an additional dial the number of quarters up to ten remaining to the credit of the consumer. As energy to the value of each quarter prepaid is consumed, the dial changes to indicate one less quarter credited. When no more coins remain to the credit of the consumer the supply is shut off automatically. The coin box will hold as much as $25 in quarters.

Type OA Prepayment Watthour Meter
INSERT QUARTER AND ROTATE LEVER TO STOP
LINE
LOAD

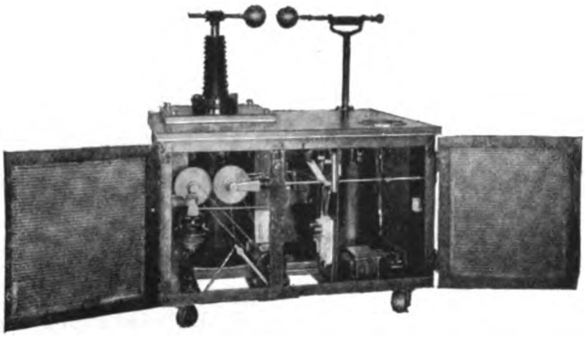
Prepayment watthour meter. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

The payment mechanism, including the cutout, is entirely mechanical and entirely contained in the meter. The cutout switch operates by means of gears and levers and is therefore positive in its action.

Meters are regularly furnished in capacities from 5 to 25 amperes, 100 and 200 volts, 60 cycles, and for rates varying from 5c. to 20c. per kw.-hr. in full cents only. Except for the prepayment and cutout mechanism, these meters are the same as the type OA meters manufactured by this company.

General Electric High Frequency Oscillator

One of the recent developments of the laboratories of the General Electric Co., Schenectady, N. Y., and now commercially available is a 125,000-volt, portable, high frequency oscillator. It is designed for the purpose of testing porcelain, high tension line insulators, and bushings by means of high frequency, high potential current. This equipment is built for operation on 25, 40, 50, and 60 cycle circuits and may be connected for 110 or 220 volts. It requires about 1½ kva. at 25 cycles, 2 kva. at 40 cycles, and 2½ kva. at 60 cycles. It will deliver current having frequencies of approximately 300,000 cycles at voltages up to about 165,000 volts.



125,000-volt high frequency oscillator for testing porcelain high tension line insulators and bushings. General Electric Co., Schenectady, N. Y.

In addition to the 125,000-volt set, to which this description applies, a 250,000-volt set for testing large porcelain parts can be furnished. A 500,000-volt set is under construction. A small 100,000-volt set designed to test a single insulator and to meet exacting requirements of portability will shortly be available. Although this last set does not have all the refinements of the larger sets, it should be very well suited for testing insulators on a line and for rough testing of stocks of new insulators ready to be placed in service.

The high frequency oscillator is designed for testing porcelain insulators only. It is best adapted to testing at the factory, laboratory or at some point on a transmission system where insulators are delivered or tested. The number of insulators that can be tested in multiple depends on the type of insulator. Five suspension type insulators can be tested in multiple at a test voltage of 80,000 and frequency of 300,000 cycles per second.

Where transportation conditions permit, the oscillator can also be used to test suspension insulators in place on the line and pick out defective ones, providing the spark potential of the individual disc is not greater than the voltage rating of the oscillator (125,000 volts).

Under the same conditions the oscillator can be used to test any pin insulator providing it is mounted on a dry wooden crossarm, or is mounted on a metal crossarm that is carried on a dry wooden pole and is not connected to a ground wire.

Merrill Electric Regulator

The Merrill electric regulator is a device which automatically controls either the voltage or the current of an electric circuit. It accomplishes this result by automatically increasing or decreasing the resistance of the circuit, or by increasing or decreasing the shunt field resistance of the dynamo which supplies power to the circuit to be regulated.

The moving element combines the properties of a meter and a rheostat, and is simple in its action because the resistance is actuated directly—no relay being necessary. This moving element is contained in an air tight tube. The regulator being air tight is also dust and water tight, and can be installed anywhere regardless of external conditions.

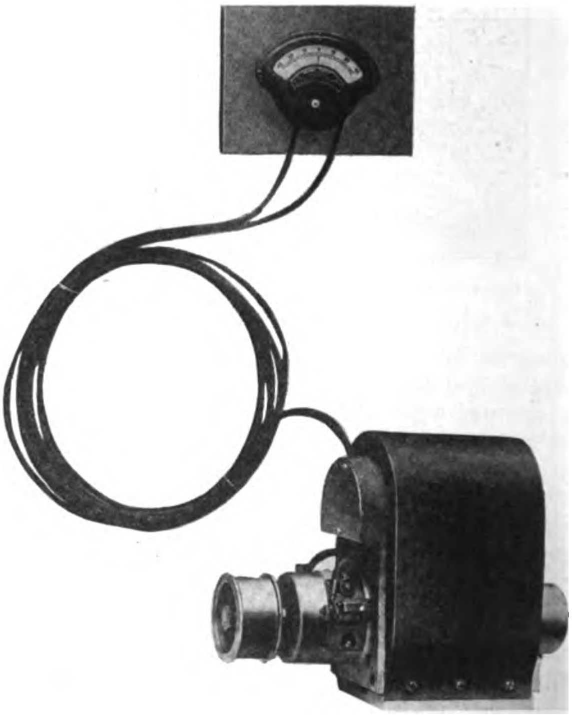
These regulators can be built for voltage or current regulation, or both. There are two general types; the machine type—so called when the resistance element of regulator is connected in series with the shunt field of a generator; the dead load type—so called when the resistance element of the regulator is connected directly in series with the load.

These regulators can also be built for either direct or alternating current—up to 60 cycles; and they may be made either positive or negative, according to the needs of the service. They are made by the Merrill Electric Mfg. Co., 313 South Clinton street, Chicago, Ill.

Esterline Electric Speed Indicator

The Esterline Company, Indianapolis, Ind., has recently placed on the market a new electrical speed indicator, consisting of a magneto type generator and a high speed electrical indicating instrument.

The generator is so designed and constructed that the voltage developed by it is directly proportional to the speed at which the armature is driven, and a volt-meter connected to the terminals of the generator indicates, therefore, the true speed of the device to which the generator is coupled.



Esterline electrical speed indicator. The Esterline Co., Indianapolis, Ind.

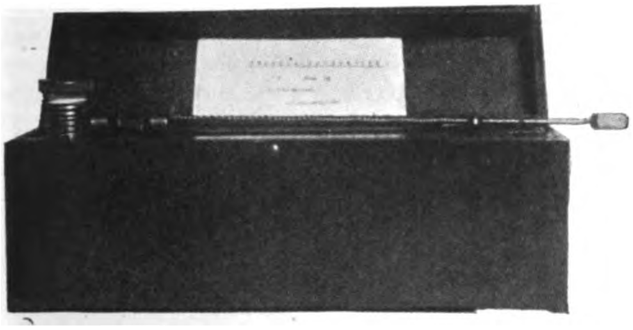
This type of tachometer has the advantage that the indicating instrument can be located a long distance from the generator, and can be placed where it is not affected by vibration or heat.

The generators can be either driven by direct connection to shafts or by means of belts or silent chains.

These instruments are applicable to the measuring of speed of any rotating or moving bodies to which the generator can be applied, and have already been successfully adapted to many industrial uses, such as speed trains, boats, line shafting, printing presses, and textile machinery.

"Uneeda" Fuse Tester

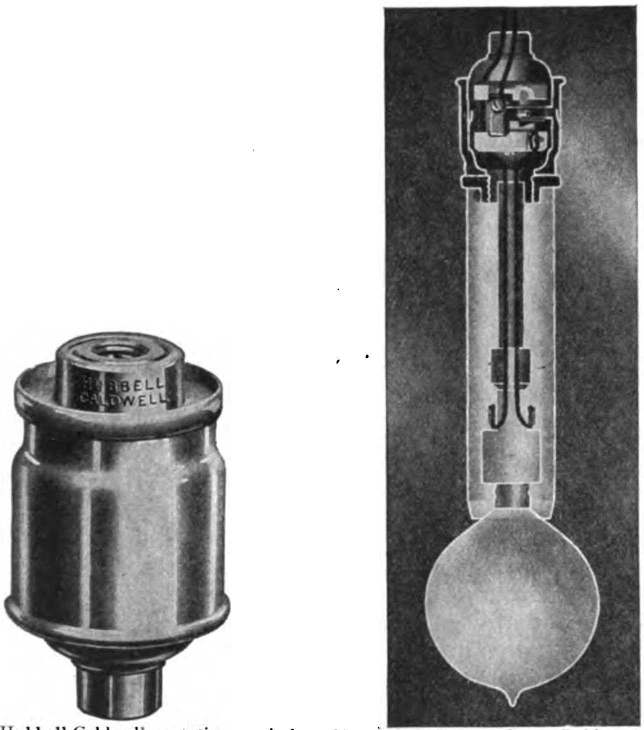
The accompanying illustration shows an instrument recently brought out by Bremer & Lang, 59 Hancock avenue, Jersey City, N. J., for testing fuses of all types, styles, and sizes. If a good fuse is placed either in the round clip or between the rod and clip, the buzzer will operate. If the buzzer does not operate the fuse needs looking after. This is a handy little instrument to tell whether or not a fuse is blown. If there are two fuses and one blows, this instrument can be employed to find out which one is perfect, which impaired.



"Uneeda" fuse tester. Bremer & Lang, 59 Hancock avenue, Jersey City, N. J.

Hubbell-Caldwell Rotating Switch

Supplementary to the other new fittings recently brought out by Harvey Hubbell, Inc., Bridgeport, Conn., is a device known as the Hubbell-Caldwell rotating switch, a cut of which is shown herewith. This switch is designed for special ornamental lighting fixtures, where a projecting key or hanging chain might detract from the lines of the fixture. A sleeve, having a continuous rotary movement, engages a brass lip, projecting from the segment, turning the light on or off. A special tripping mechanism makes it impossible to injure the switch by turning it the reverse way. The supplementary cut shows a lighting fixture with the rotating switch properly installed.

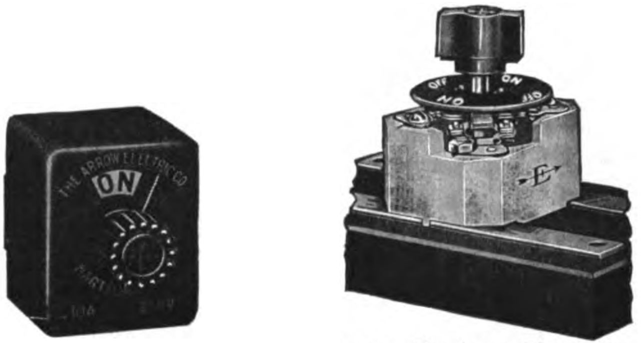


Hubbell-Caldwell rotating switch. Harvey Hubbell, Inc., Bridgeport, Conn.

Arrow Switches for Panelboards

These cuts show the new panelboard switches recently put on the market by The Arrow Electric Co., of Hartford, Conn. They are equipped with either round or wing handles, and they come either with or without cover. The cover is of black composition, entirely covering all current carrying parts and protecting the user from shock while opening or closing the branch circuits.

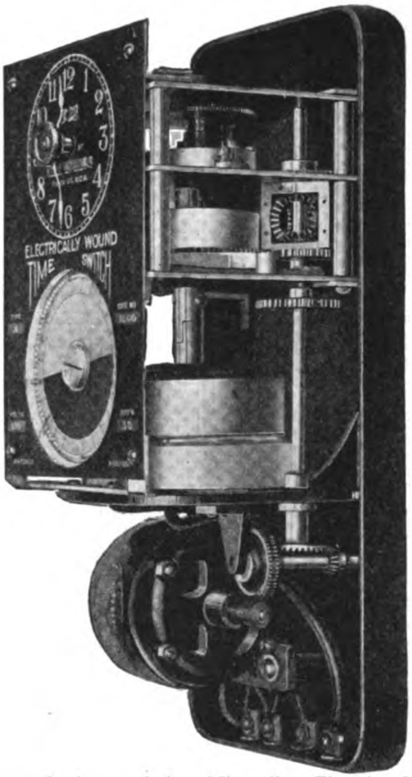
For both types of switches the outside dimensions of the porcelain base are 1⅝ by 2 inches. The height over all of the base is 1 5/64 inches. The four screw holes are spaced 1⅝ inches on centers diagonally and 1½ inches horizontally. The base is designed to allow a minimum spacing of ⅞-inch between the branch bus-bars. The bridge wall separating the bus-bar terminals is ⅛-inch.



Panelboard switches, with and without cover. The Arrow Electric Co., Hartford, Conn.

Minerallac Electrically Wound Time Switch

The type "A" time switch shown in the annexed cut has recently been put on the market by the Minerallac Electric Co., 400 S. Hoyne avenue, Chicago, Ill. It is designed to be used where it is necessary automatically to control circuits through the use of standard rotary snap switches and where frequent operations are necessary



Electrically wound time switch. Minerallac Electric Co., 400 South Hoyne avenue, Chicago, Ill.

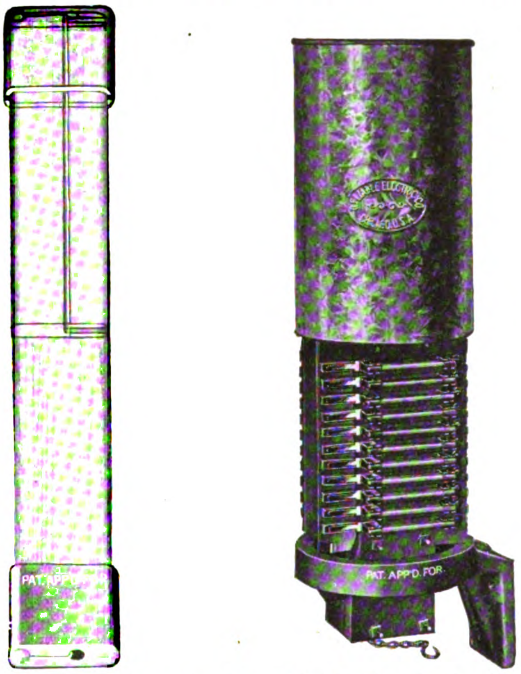
over the entire 24-hour day. It is well known that by the use of the rotary snap switch combinations of switching can be had that are not possible in any other type of switch. By merely changing one snap switch (shown at "L" in side view), for another any combination of "on and off" can be effected.

For this particular switch the makers claim that it does away with the need of carrying a large variety of switches of different capacities, as it will take care of any load from 5 to 35 amperes.

If the winding current is accidentally shut off, the switch and clock springs have sufficient storage to keep the switch operating for a long period of time. It will fully rewind when current is turned on.

Reliable Cable Terminal

Dealers in telephone fittings and supplies will note that the Reliable Electric Co., 411 South Sangamon street, Chicago, is offering the new flat fuse shown in the annexed cut. It is made so that anybody can install it on short notice. As shown, the heavy phosphor-bronze fuse clips take firm hold of the flat fuse, thus insuring excellent contact.



Ideal fuse for telephone protection. Reliable Electric Co., 411 South Sangamon street, Chicago, Ill.

Fuseguard Enclosed Fuses

A new line of enclosed fuses carrying the above trade name, has just been brought out by the Electric Fuseguard Co., 391 Mulberry street, Newark, N. J. These fuses are furnished in three general types—"Instantload," "The National Electrical Code" and "The Old Code." These fuses are made in accordance with specifications of the Underwriters' Laboratories. The fusible elements are made up of many sub-divisions, and the filling material is granular in form, chemically inert, and non-absorptive.

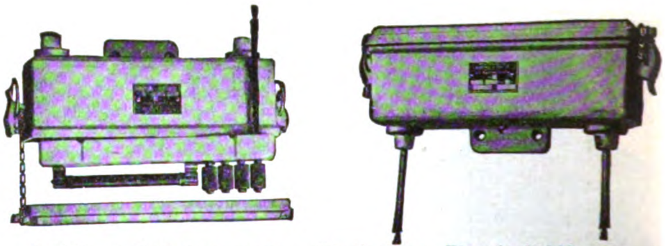
Fuseguard "instantload" enclosed fuses. Electric Fuseguard Co., 391 Mulberry street, Newark, N. J.

Fuseguard waterproof service switch and outlet hood. Electric Fuseguard Co., 391 Mulberry street, Newark, N. J.

In addition to these fuses this company is also marketing a complete line of fuseguard accessories, such as fuse boxes, waterproof service switches, outlet hoods, branch boxes, and auto fuse material.

Westinghouse 2,500-Volt Lightning Arrester

The Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., announces an addition to its line of lightning arresters in the form of a low-priced spark gap and resistance arrester known as the type CR. This is a single-pole lightning arrester for alternating-current circuits of any frequency or capacity and for pressures up to 2500 volts. The arrester may be installed out of doors on poles or buildings, or indoors on station walls.



A 2500-volt lightning arrester. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

The weatherproof metal case protects the arrester units from rain or snow when installed in exposed locations.

This arrester consists of a series of spark gaps between non-arcing cylinders in series with a resistor. Four cylinders are used for the spark points so that in case of burning the cylinder can be turned to give a new arcing surface.

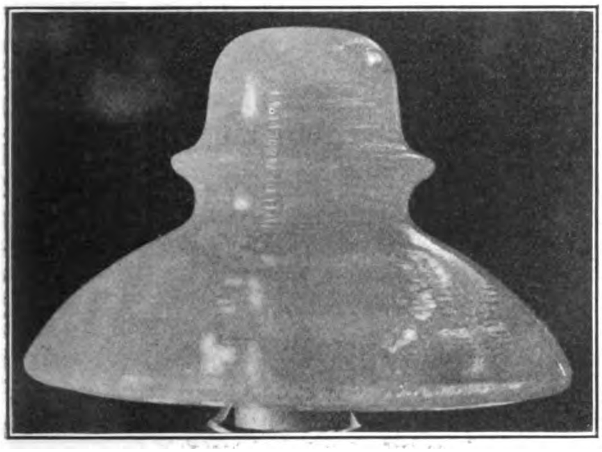
The resistor prevents the power arc that might occur on systems of large capacity if the spark gaps alone are used, making the arrester suitable for circuits of any capacity. The resistance is low enough to give good protection, but high enough to insure reliable operation, and to enable the non-arcing metal gaps to quench the arc to the end of the first half cycle.

The manufacturers recommend one set of type CR lightning arresters at each distributing transformer with a minimum of five sets of arresters to one mile of line.

Locke Boron-Aluminum-Silicate Insulator

A new line of insulating material composed of boron, aluminum, and silicon has just been put on the market by Fred M. Locke, of Victor, N. Y.

The material is fused together at extremely high heat, and formed into shape about the same as glass. It is strong mechanically, and shows great resiliency. Its dielectric constant is 4.8, while that of porcelain is 6.0, and glass 8.0. Its coefficient of expansion is low, being next to fused silica. It will stand big temperature changes without cracking. Its specific gravity is low, about 2.26.



Boro-porcelain and boro-silica insulators. Fred M. Locke, Victor, N. Y.

The Locke 5 A insulator, which is 5 inches in diameter and 3½ inches high, will stand an arc-over test of 75,000 volts, and a dielectric test of 140,000 volts. The thickness through the thinnest part does not exceed ½ inch. A porcelain insulator of the same dimensions will, it is said, stand an arc-over test of about 50,000 volts, and dielectric test of considerably less than 100,000 volts.

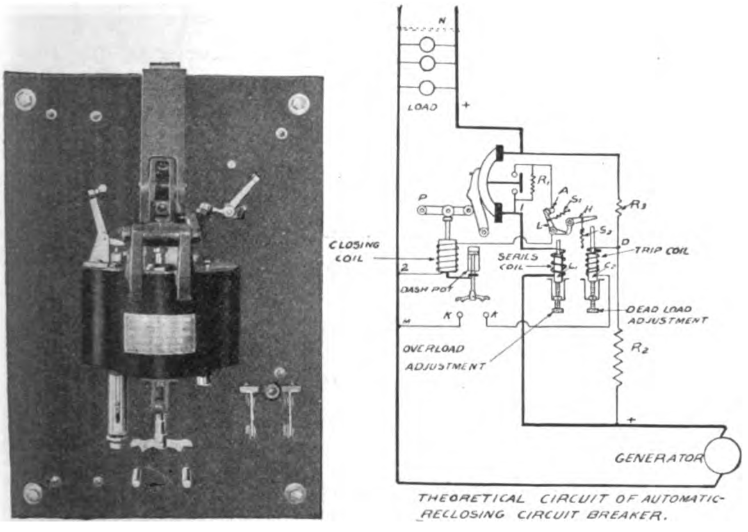
Automatic Reclosing Circuit Breaker

A circuit breaker that differs in many respects from the one described on page 30 of the ELECTRICAL RECORD for June, 1914, is now being offered to the trade by the Automatic Reclosing Circuit Breaker Co., 31 West Mound street, Columbus, Ohio. This breaker has two separate adjustments, one for overload conditions at which it opens; the other is the dead load adjustment. By dead load adjustment is meant the adjustment for current which will flow at instant of reclosing. The dead-load setting is necessarily somewhat lower than overload setting, in order to prevent the breaker opening instantly after closing.

It is the ability of this type of breaker to distinguish between a legitimate load resistance of a low value, and an actual short circuit, which renders it a commercial success. In a number of installations where these breakers are used it has been found that the dead load consisting of lamp self-starting motors, etc., required a current at instant of closing almost equal to current at which the breaker was set to open.

A dash pot is provided so as to furnish a definite time interval between the opening and closing of breaker in case of momentary overloads, the object being to give starting box levers time to return to the off position before throwing the power back on the line.

The general appearance of these machines is shown in the annexed cut. All magnet coils and the dash pot are contained within a cast iron housing, thus being thoroughly protected mechanically. Sufficient heat is and free from moisture. The accompanying diagram shows the theory of operation of this device.

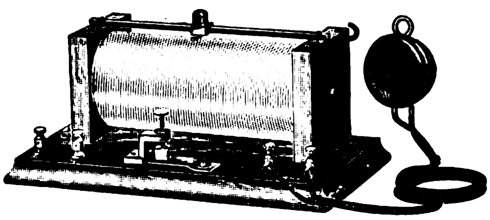


Automatic reclosing circuit breaker. Automatic Reclosing Circuit Breaker Co., 31 West Mound street, Columbus, Ohio.

Bunnell Wireless Devices

Several new devices for use in connection with wireless apparatus have recently been put on the market by J. H. Bunnell & Co., Inc., 32 Park place, New York. These devices include:

The "Beeko" variable condenser for wireless receiving circuits has a few new features not found in other condensers. It has a scale calibrated to 180 degrees in two degree divisions. The rotary is so arranged that it can be mounted in a horizontal position and remain at any point; it can be set without an additional balance. When mounted in the case, it is so

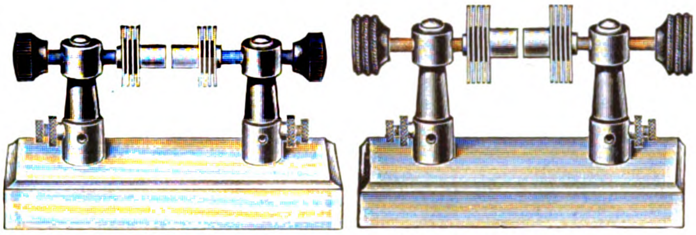


"Mascot" receiving set. J. H. Bunnell & Co., Inc., 32 Park place, New York.

arranged that the knob can only be turned 180 degrees, thus avoiding unnecessary turning as the condenser will either be in or out on half a turn of the knob.

The "Mascot" receiving set for short distance receiving consists of the "Mascot" tuner having a single slide Beeko detector stand, and fixed condenser all mounted on a cherry base. The set includes 80 ohms D. P. watchcase receiver with telephone cord and crystals.

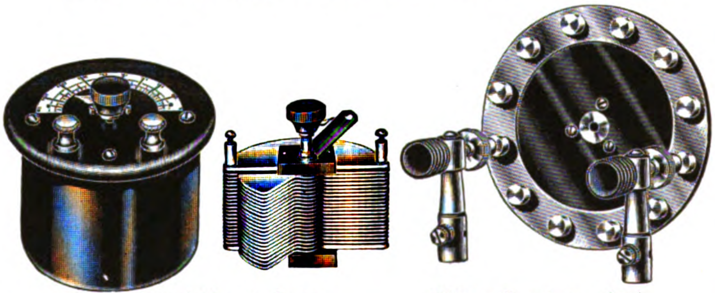
The "Jove" spark gap is a new departure in stationary spark gaps. It has a specially concealed spring adjusted in the upright which can instantly control the adjustment and will also keep it permanent when once it has been made. The electrodes are fitted with radiators and knurled hard rubber handles. Entirely finished in nickel and mounted on porcelain.



"Dandy" gap. "Jove" spark gap.

J. H. Bunnell & Co., Inc., 32 Park place, New York.

The "Dandy" gap is a smaller edition of the Jove gap and has smaller electrodes, standard and radiators.



"Beeko" variable condenser. "Mascot" rotary wheel.

J. H. Bunnell & Co., Inc., 32 Park place, New York.

The "Mascot" rotary wheel has a 6-inch disc of hard rubber on which are mounted twelve electrodes and bearing for motor shaft. The uprights are the same as those used on the Jove gap but larger.

Other new wireless devices made by this company will be described in a future issue.

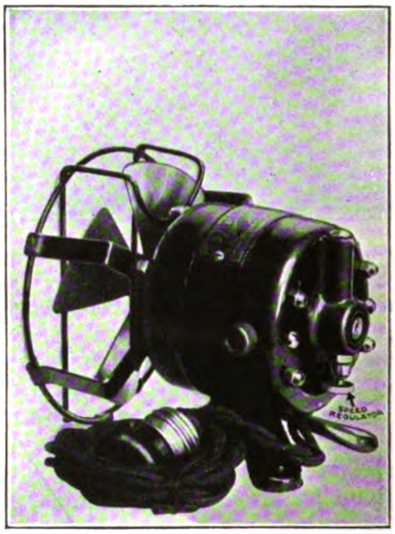
Eck Direct Current Commutating Pole Motor

The Eck Dynamo and Motor Co. of Belleville. New Jersey, has recently marketed what it calls a high-grade, type D, commutating pole direct current motor. Among the special features incorporated in this motor, which the maker claims is the best of its kind that has yet appeared, are the following: Commutating poles, which assures a fixed point of sparkless commutation, which does not change under variations in the load; double row, self-aligning ball bearings, by which perfect alignment of the shaft and bearings is secured; positive ventilation by internal fans; entire absence of magnetic hum; short shaft length; low shaft center; high efficiency at all loads; radial brushholders and carbon brushes which work in both directions of rotation without change.

High grade direct current motor. Eck Dynamo & Motor Co., Belleville, N. J.

Racine One-Man Portable 4-Inch Fan

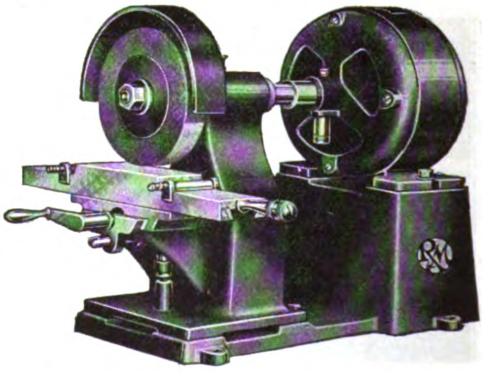
Travelers who like to be comfortable in out of the way places in warm weather will be interested in the new portable 4-inch fan which has just been put on the market by the Racine Electric Co. of Racine, Wis. This fan weighs only 2½ pounds and takes up a space of only about 4 inches square. It will fit into an ordinary hand bag or in a corner of a small trunk. It is as easy to carry about as a flatiron, and may be attached to any electric circuit operating on from 110 to 130 volts. The motor being of the universal type, it matters not whether the circuit is direct or alternating. A speed regulator enables the owner to adjust the breeze to local conditions.



Racine "One Man" fan. Racine Electric Co., Racine, Wis.

Electric Driven Grinder for Preparing Rubber Test Samples

This machine has recently been developed by the Emerson Apparatus Co., 251 Causeway street, Boston, Mass., for the purpose of preparing samples of rubber of uniform cross-section for tests of tensile strength.



Machine for testing rubber samples. Emerson Apparatus Co., 251 Causeway street, Boston, Mass. Operated by Robbins & Myers motor.

Its principal use is for preparing samples of hose lining for test.

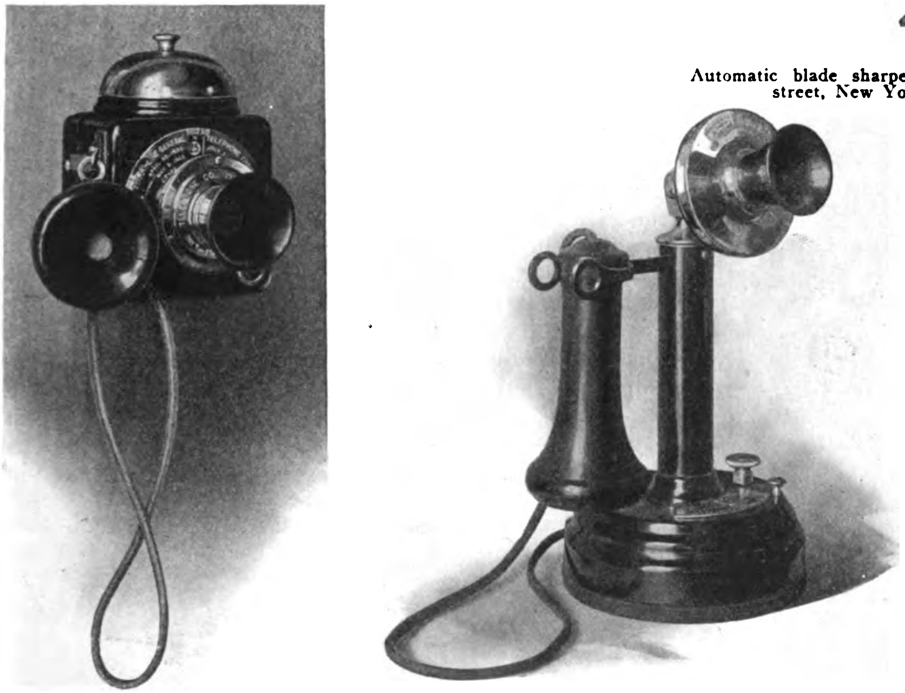
A section of hose several inches in length is slitted along its length, and the interior lining with its rubber backing is stripped from the fabric. This strip of rubber is cut to a uniform width of one inch throughout a distance of three or four inches along the middle of its length. The strip is then strapped closely to the platen of the grinder, smooth side down, and it is held firmly in position by the two eccentric rolls.

By means of the longitudinal, vertical and cross adjustment of the platen of the grinder, the sample may be quickly ground down to a uniform thickness throughout the length of the test section.

The grinder is direct driven by a 1/6 horse power motor manufactured by The Robbins & Myers Co., Springfield, Ohio.

Direct Line Telephone

A new system of intercommunicating telephones has recently been developed by the Direct Line Telephone Co., 450 Broome street, New York. This system is said to be greatly in advance of all other similar systems in that outsiders cannot interrupt or listen to what is being said over a busy wire. For this reason it is called a secret service telephone system. It is automatic in all respects, mechanically performing all the duties of a human operator. All the user has to do is to turn a small switch to the number desired and then press a button. If the line is busy, he receives a signal to that effect; if the line is free, he is in immediate connection with it.

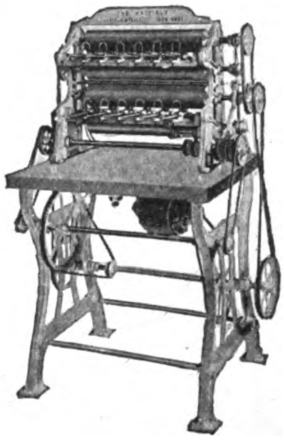


"Direct-Line" secret service telephone instruments. Direct-Line Telephone Co., 450 Broome street, New York.

These telephone are installed on what is called "unit" system. All connections are made by means of the connector, which makes it possible to divide any system into two parts, three parts, or individual units, until any trouble that may occur on the line is localized. With the Direct-Line connector this, it is claimed, can be so rapidly and easily accomplished that the interruption to service is scarcely noticeable. By means of this connector any telephone instrument in a system can be disconnected and replaced by a new one in a few minutes. All the instruments are hermetically sealed and never repaired while in service, defective instruments being removed and replaced by new ones.

Electric-Driven Automatic Blade Sharpening Machine

The outfit illustrated is made for sharpening the blades of any of the three hundred odd makes of safety razors now on the market. It has a capacity of 12 blades at a time of any make and will sharpen 10 dozen blades per hour.



Automatic blade sharpening machine. Hyfield Mfg. Co., 48 Franklin street, New York. Driven by Robbins & Myers motor.

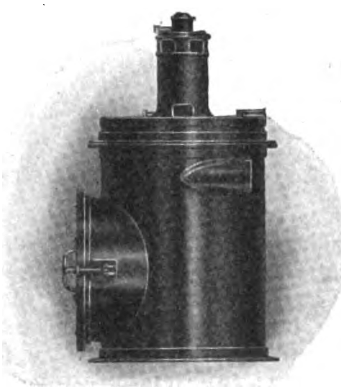
By means of a set-screw adjustment the blade angle can be changed to give any desired bevel to the edge so as to adapt the machine to the different bevels to which different makes of blades are originally ground.

The machine is finished attractively to adapt it for use in show windows, as it has proved to be a good attention getter for the store which places it in the window.

The machine is equipped with a 1/6-h.p. Robbins & Meyers motor. The outfits are manufactured and sold by The Hyfield Mfg. Co., 48 Franklin street, New York.

Spencer Vacuum Cleaner for Home use

The Spencer Turbine Cleaner Co., of Hartford, Conn., is making a new liine of



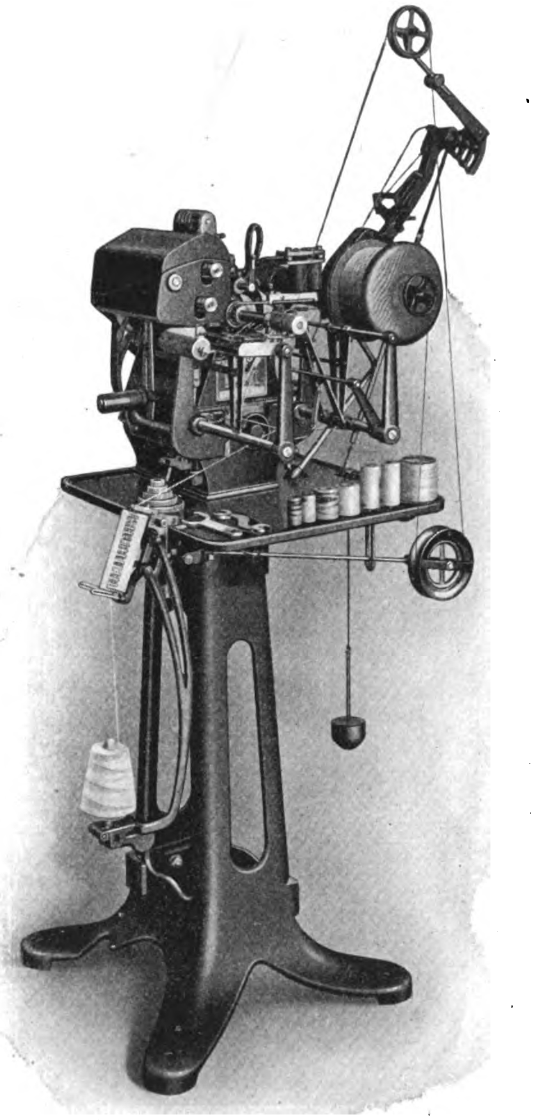
Model No. 211 stationary vacuum cleaning outfit. The Spencer Turbine Cleaner Co., Hartford, Conn.

stationary vacuum cleaners for use in homes and apartment houses. This type is known as No. 211 outfit. It is operated by a Westinghouse universal motor mounted on top of the machine. This cleaner is 39¼ inches high and 21 inches in diameter. It can be located permanently in the basement, where the dust from the receptacle can easily be removed and carried to the trash box.

Leeson-Universal Coil Winder

A new form of machine for winding magnet coil has recently been developed by the Universal Winding Co., 95 South street, Boston, Mass. Cut of it is shown herewith. This machine does automatically what was formerly done by means of hand work. It produces what are known as Leeson-Universal coils.

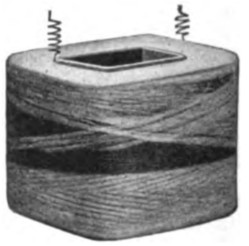
In winding this coil, a fine cotton yarn is interwoven with the wire, which may be either enameled or insulated with silk, cotton, or other suitable material. The plane of the wire convolutions is at right angles to the axis of the coil, while the plane of the cotton strands lies obliquely to the axis, the entire mass being bound together so that the finished coil is practically indestructible either from external or internal stress.



Automatic coil winding machine. Universal Winding Co., 95 South street, Boston, Mass.

In the winding process the yarn is so disposed that the convolutions of wire are slightly separated; and while a complete insulation between the several layers of wire is not obtained, there is secured a graded insulation which is thickest where the potential difference in voltage is highest.

The amount of insulation may be varied, depending, naturally, upon the design of the coil. The interposing of the yarns between the layers and turns of wire facilitates the impregnation of the coils with the various insulating compounds. The mass of yarn between the layers and between the coils also forms a cushion, making an elastic coil, so that when high voltages or heavy currents are passed through, the coil is not ruptured or destroyed.



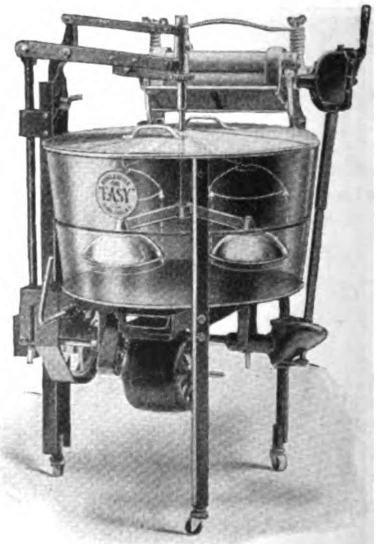
Leeson-Universal meter coil, wound by automatic coil winding machine shown above.

Glow Worm Submarine Bait

Those who are on the lookout for electrical novelties will be interested in hearing that the Luminous Submarine Bait Co., 666 Forest Home, Milwaukee, Wis., has just brought out a fish lure, known as "The Glow Worm." This device consists of a small receptacle containing three small dry cells, miniature mazda lamp, and several small bull's-eye glass windows. Several gang hooks are attached at convenient places, so as to catch the fish when lured by the rays of light. The makers say that this form of bait has passed the inspection of the state game warden and conforms with the state fish and game laws of Wisconsin.

Dodge & Zuill Plunger Washer

The accompanying cut shows a modified form of the electric washer made by Dodge & Quill, of Syracuse, N. Y., and described at length in one of our previous issues. The new washer is said to be much simpler in design than the older forms, and far more efficient in operation. By means of suitable gearing, the same motor that drives the plunger is used to turn the wringer. This device has sufficient capacity to take care of a normal family washing.



New type of plunger washer. Dodge & Zuill, Syracuse, N. Y. Operated by Robbins & Myers motor.

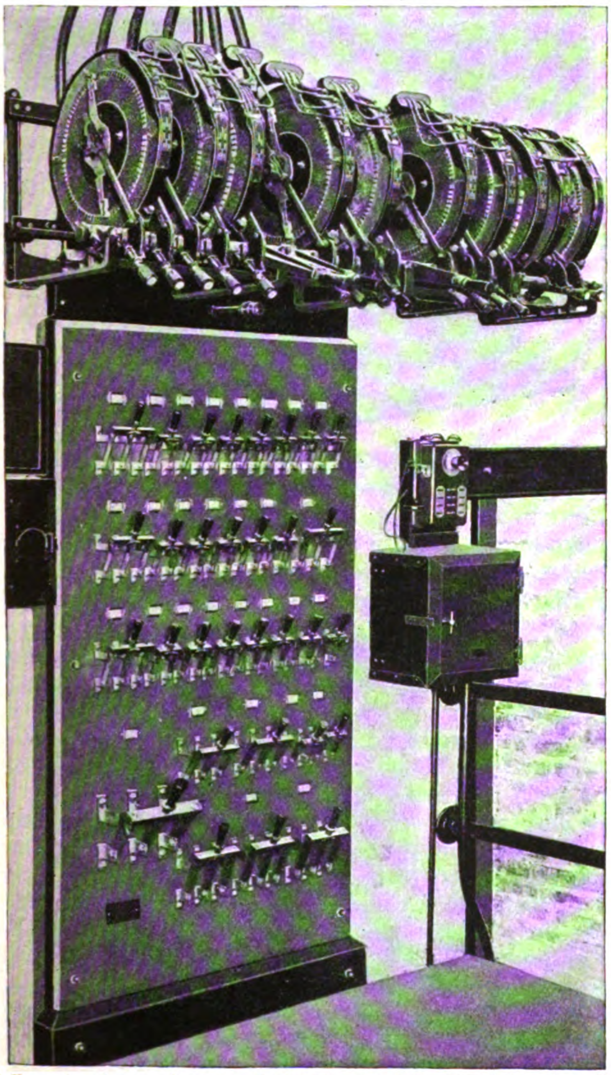
Thurman Vertical Motor Vacuum Cleaner

The Thurman Vacuum Cleaner Co., of St. Louis, Mo., has just brought out a new type of vacuum cleaner, which is equipped with a vertical one-sixth horsepower universal motor. This motor drives a 6-blade steel fan. The motor is controlled by a concealed push button switch in the handle. The cleaner is equipped with a rotary bristle brush for picking up lint. This cleaner weighs about 9 lb.

Vertical motor vacuum cleaner. Thurman Vacuum Cleaner Co., St. Louis, Mo.

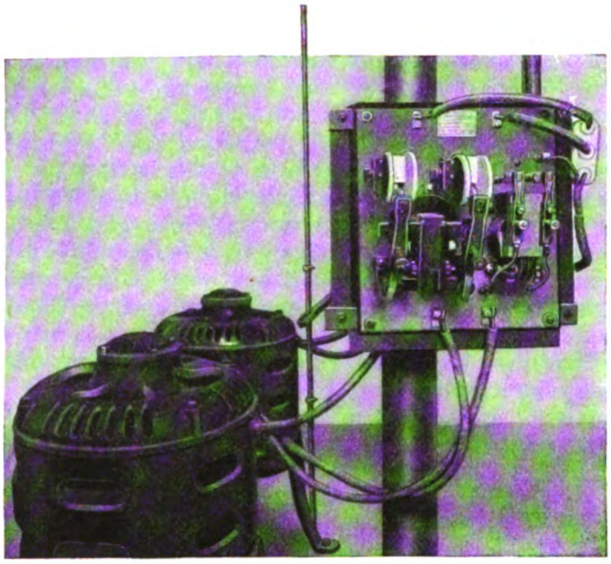
Dimmers and Pumps for Medium Size Theatres

In many of the theatres of medium size now building throughout the country a small 10-plate dimmer bank is mounted just above the switchboard to provide for the necessary stage lighting effects. In one of these theatres in Chicago the dimmer was built and installed by the Cutler-Hammer Mfg. Co., of Milwaukee. The ten plates composing it are really the equivalent of twenty, as each side of the plate carries resistance and contact segments, and is a separate dimmer. This construction makes it possible to save space. It also makes it possible to use one plate as a complete two-wire or a complete three-wire dimmer.



Medium size theatre dimmer. Cutler-Hammer Mfg. Co., Milwaukee, Wis.

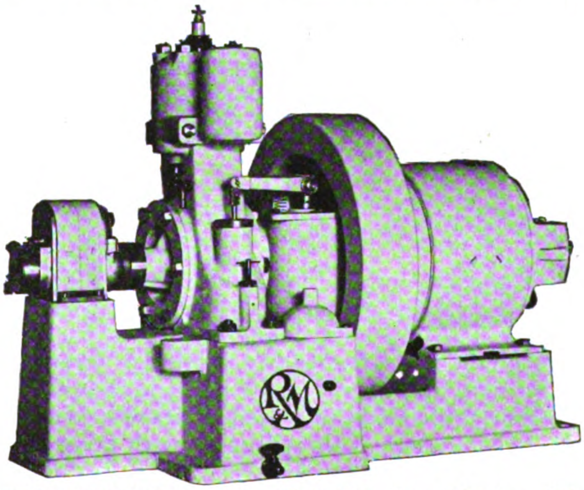
The basement of this building is automatically kept free from water by two 5 h.p. alternating current motor-driven sump pumps controlled by Cutler-Hammer float switches and automatic motor starters. In the illustration one of the automatic starters is shown mounted on a post. On the back of this post a float switch is installed which is operated by a rod on a float in the sump. As the water rises in the sump the float and its rod moves upward.



Automatic starter for operating 5-h.p. sump pump. Cutler-Hammer Mfg. Co., Milwaukee, Wis.

Okey Isolated Plant Lighting Unit

A new lighting unit manufactured by the Okey Mfg. Co., Columbus, O., is shown herewith. It is made in two styles, the first known as type "F," is equipped for furnishing current direct to the line with no storage battery auxiliary. This outfit is for service where a certain number of lamps are burned



Small isolated lighting plant. Okey Mfg. Co., Columbus, Ohio. Robbins & Myers generator.

through the entire night, or when current is required at stated hours only, during which period the engine is operated.

The second outfit, known as type "FB," has an auxiliary storage battery so current can be had at any time, whether or not the engine is running. The battery is of small capacity, the main load being carried by the engine.

A load equivalent to eight 16 candle-power lamps will operate off the battery without starting the engine. As soon as one more lamp is turned on, however, the engine is automatically started, the generator acting as a motor with the battery supplying current until the engine is started.

After the engine has started it will continue to operate, even though all the lamps are turned off at once, until the battery is completely charged. Then the engine is automatically stopped and the load is transferred from the generator to the battery.

In the event that more than eight lamps are burning when the battery becomes fully charged, the controller cuts off further charge, but leaves the engine running until the lamp load has been reduced below eight lamps; the engine then stops and the load is transferred to the battery.

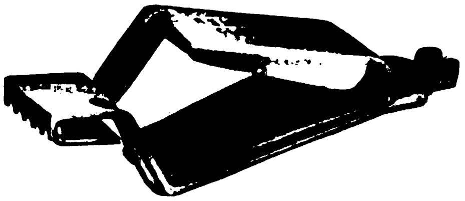
Two push buttons are provided on the front of the controller, by means of which the engine may be started or stopped at will, independently of the automatic controller.

The controller also is so constructed that it automatically gives the battery a so-called "over-charge" at every twelfth charge. This periodic over-charge is claimed to increase the life of the batteries.

The generator is made by the Robbins & Myers Co., Springfield, O. The type "F" sets are wound for 115 volts and those for type "FB" are wound for 42 volts to operate with the 32-volt battery system. The generators for both types are compound wound to give flat voltage regulation at all loads.

Mueller Universal 20-Ampere Test Clip

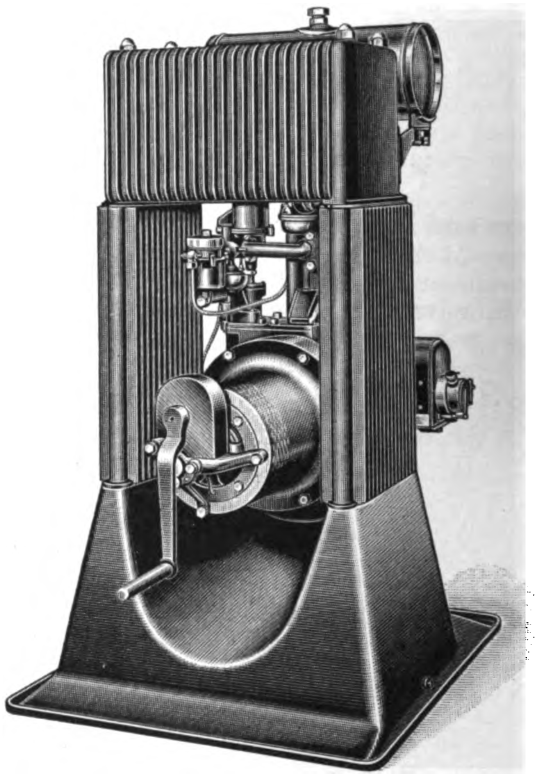
R. S. Mueller & Co., 423 High avenue, S. E., Cleveland, Ohio, manufacturers of the "Universal" test clip, announce that they have just put on the market a clip of a new size which also has some new features in design. The new clip will carry 20 amperes continuously without heating. The side members are made of copper, and the metal spring is enameled so that the entire clip is non-corrosive when used in the weather. The jaws have an opening or spread of ⅞ inch, so they may be readily applied to large terminals and binding posts. In the new clip a screw connection for the cord is provided in place of a connection to be soldered. This will meet with favor among linemen and others who work in the field a long way from headquarters, as with the screw connection they can readily repair the broken cord, a thing they could not do when the connection had to be soldered.


Universal test clip. R. S. Mueller & Co., 423 High avenue, S. E., Cleveland, Ohio.

The manufacturers announce further that this new 20 ampere clip is also offered lead-plated for use in charging storage batteries. Rubber insulators are provided when specified, which not only protect the user from shock, but serve to prevent the clips short circuiting on each other when applied to adjacent terminals.

"Uni-Lectric" Lighting Plant

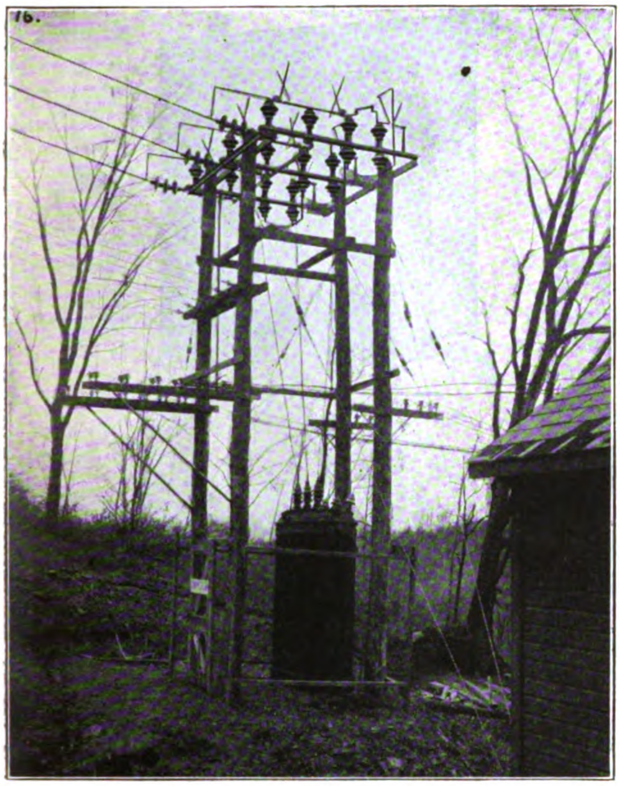
The "Uni-Lectric" lighting plant is a complete self-contained electric generating set for yachts, cruisers, boat houses, plantations, farms, country homes, small stores, and other places where a moderate amount of electric light and power at small cost may be required. It consists of a small four-cycle motor direct connected to a generator with a capacity of ¾ kilowatt at a pressure of 110 volts. The motor has a rotary sleeve valve, and the generator is cooled by forced draft. No switchboard or batteries of any kind are used. The ignition is by high tension magneto with fixed spark and the machine is intended to run steadily 24 hours per day if desired, so the batteries are not required for starting purposes. In avoiding the use of storage batteries the efficiency of the machine has been considerably raised, and the economy and the cost of upkeep has been greatly reduced. It is absolutely automatic; after starting the operator has only to keep it supplied with oil, water, and gasoline.


Uni-Lectric lighting plant. Waterman Marine Motor Co., 225 Mt. Elliott avenue, Detroit, Mich.

In addition to supplying current for electric fans, toasters, vacuum cleaners, sewing machine motors, or power motors for general farm work, this outfit will operate an automatic electric pumping outfit of either the pressure tank or elevated tank system. For power purposes it will do all the work of the ordinary so-called 2 h.p. gasoline engine of the stationary or farm type. It is made by the Waterman Marine Motor Co., 225 Mt. Elliott avenue, Detroit, Mich.

Wood Pole Outdoor Substation

The increasing opportunity for central stations to supply power from transmission lines is now generally recognized, and the outdoor substation enables service to be given at a low cost. A standard method of constructing wood pole stations is shown herewith, the large capacity three-phase transformer being set at ground level. This low cost 33,000-volt, three-phase installation taps a high tension feeder, and supplies current to a clay products' plant.

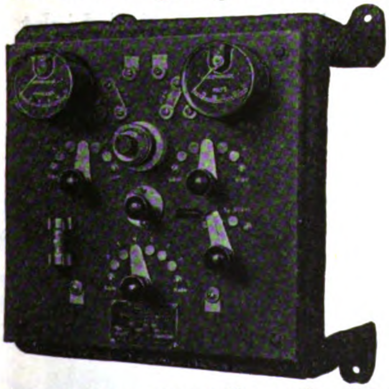


Wood pole outdoor substation. Delta-Star Electric Co., 617 West Jackson boulevard, Chicago, Ill.

The high tension switches, fuses and lightning arrester equipment is of the type "CRE" form, manufactured by the Delta-Star Electric Co., 617 West Jackson boulevard, Chicago, Ill.

Westinghouse Small Mercury Vapor Rectifier

The Westinghouse Electric & Mfg. Co. has recently placed on the market a small mercury rectifier charging outfit, known as the modified type E, specially designed to suit the needs of public garages that have a number of gasoline automobile lighting and starting batteries to charge each night. It is arranged for mounting at a convenient place on the wall.



Type E, 10-ampere mercury vapor rectifier outfit. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

It consists of a cast iron wall bracket on the front of which is a small slate panel having mounted thereon the necessary switches and connections. The mercury bulb is mounted behind the panel where it is well protected, and is tilted for starting by means of a knob on the front of the outfit. Back of the bulb and mounted on the wall bracket are the transformer and reactance coil.

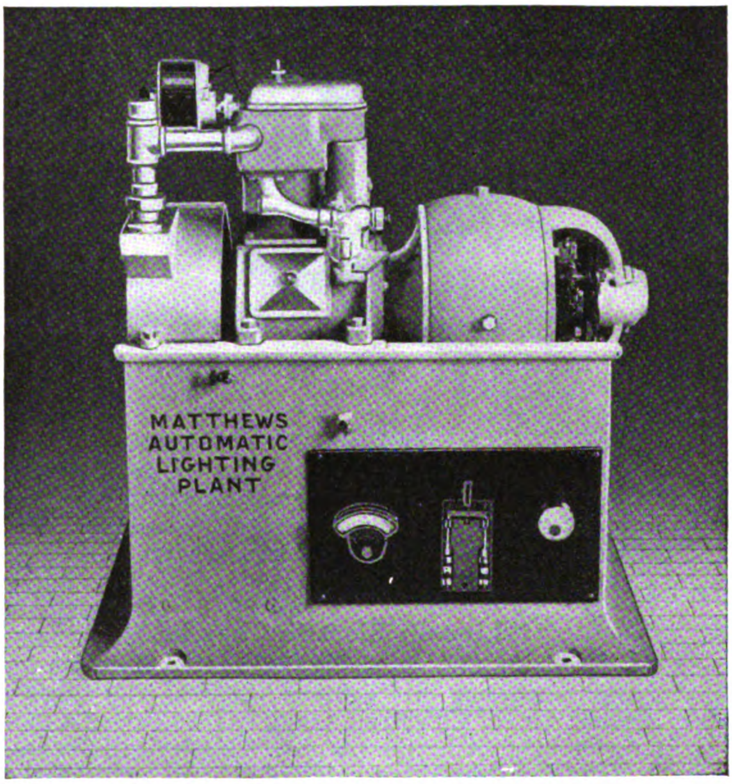
The outfit is designed for charging—one 3-cell battery at a time, or a considerable number of such batteries in series. Provision is also made for charging one or two single cells which is particularly advantageous if there happen to be one or more low ones present. Both 5 and 10-ampere outfits are available for charging 1 to 18, or 1 to 36 cells, and all outfits are designed for operation on either 110 or 220-volt, 60-cycle circuits. Simple link connections are provided for adjusting the outfit to suit either voltage.

The average hourly cost of charging with these outfits at a 5c per kilowatthour rate for current is about $0.012 for 6 cells, $0.025 for 18 cells and $0.048 for 35 cells using the 10 ampere outfits. With the 5-ampere outfits, the hourly cost for current is correspondingly reduced.

Similar outfits for the use of the car owner who desires to charge one or two batteries at home are also available.

Matthews Automatic Lighting and Power Plant

This small lighting and power unit is now being marketed by the Matthews Boat Co., of Port Clinton, Ohio. It is built in two sizes—1 kw. and 2 kw., respectively. The motive power consists of a 1 or 2 cylinder engine, operating on 4 cycles at a speed of 1,200 r. p. m. These engines develop 2 and 4 h.p., respectively.



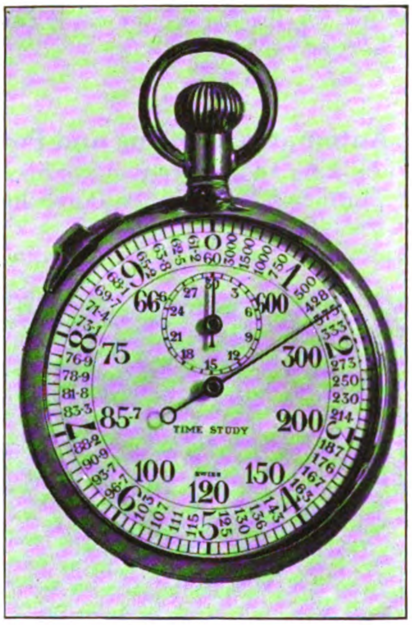
Matthews automatic lighting plant. Matthews Boat Co., Port Clinton, Ohio.

These plants are built for either house or marine lighting. With the marine plant the company furnishes a special low weight base, so that the outfit can be readily placed in a small boat. The 2-kw. plant is said to meet the specifications for the wireless equipments now used on steam going vessels.

The 50-light plant consists of a 1-cylinder, 4-cycle gasoline engine, direct connected to a generator, and built in one unit. The engine and generator are combined in one casting, and, in connection with the radiator for cooling the jacket water, electrical controlling devices, and switchboard, are mounted on a cast-iron sub-base. This base also contains the cooling water tank and oil reservoir holding a sufficient amount of oil and water for several months' service without attention. This plant occupies a small space, about 3 feet long by 23 inches wide, and 3 feet high. With the machine is supplied an enclosed type 32-volt storage battery which occupies a space of 4 feet by 1½ feet.

Time Study Watch

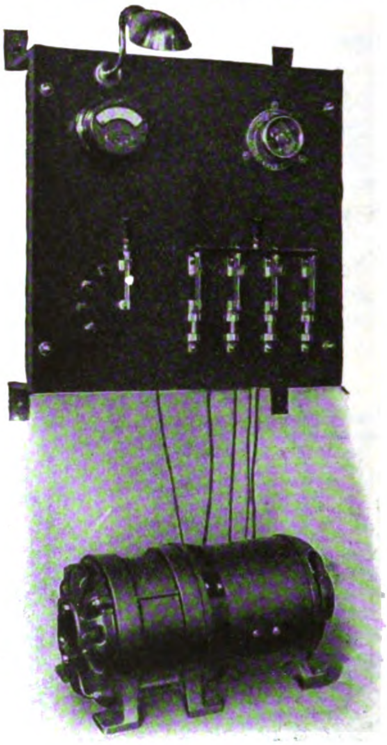
Those whose needs require them to find out just how much time is taken to perform different jobs—to make part of a tool or instrument, repair it, or install equipment of any kind—will be interested in this device. It does automatically and instantly many things that usually require pencil, paper, and complex mental processes. It is designed specifically for use in solving time study problems. It is made by M. J. Silberberg, Peoples Gas Building, Chcago, Ill.



Time study watch. M. J. Silberberg. Peoples Gas Bldg., Chicago, Ill.

Lincoln Electric Charger

Realizing the increasing demand for a device for charging sparking and lighting batteries, The Lincoln Electric Co., of Cleveland, Ohio, has developed a motor-generator set for this purpose. This device differs essentially from the charger described on page 38 of the April issue of the Electrical Record. The outfit comes complete with switchboard as shown in the photograph. The motor-generator set is a two bearing ball-bearing machine, thus insuring alignment of the bearings. The set consists of a single phase motor with a shunt wound generator. The motor is non-self-starting and starts up from the direct current end, the current being taken from the battery which is to be charged, the generator acting as a shunt motor. This method of starting is accomplished by having two middle clips of the four pole switch higher than the remainder. These are connected to the battery and engage first as the switch is closed. When these are engaged by the switch, it throws the battery across the armature and the machine starts to revolve. When the set gets up to speed, the switch is thrown entirely in and the alternating current being thrown on, the set begins to charge the battery. The batteries are charged in series, the charging current varied by raising or lowering the field voltage. This makes a flexible arrangement and is one suitable for garages where the number of batteries to be charged varies from day to day.

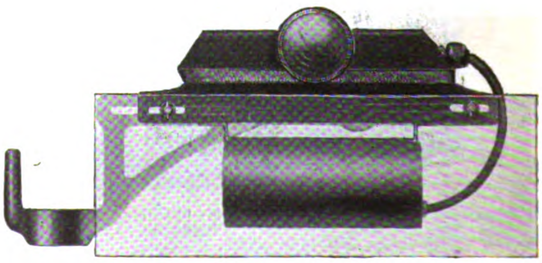


Electric charger for motor cars. Lincoln Electric Co., East 38th street and Kelley avenue, Cleveland, Ohio.

The outfit is made in two sizes, the smaller accommodating any number of cells from 1 to 8, the larger accommodating any number of cells from 1 to 15. This outfit will appeal more particularly to garages than to individual drivers.

Malco Battery Tail Light

The accompanying cut shows a new form of tail light which has recently been put on the market by the Malton Specialty Co., 755 Boylston street, Boston, Mass. The makers claim that it will fit any number



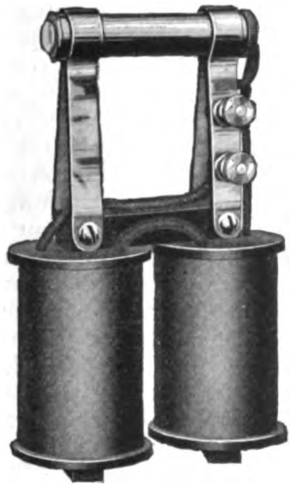
Malco battery tail light. Malton Specialty Co., 755 Boylston street, Boston, Mass.

of plate holders without alteration and that it can be attached flat against the car body.

The lamp is made of heavy steel fitted with a removable silver-plated reflector. The Ediswan socket and switch are made in one unit. The rear ruby signal is 2½ in. in diameter. The base of the lamp is fitted with an intensifying glass which excludes dust and insures evenly lighted numbers. The cover is fitted with a thumb lock. This tail light is furnished complete with combination socket and switch, 1½ volt lamp, and wired complete without batteries. The finish is ebony with nickel trimmings.

Benjamin Ford Magnet Recharger

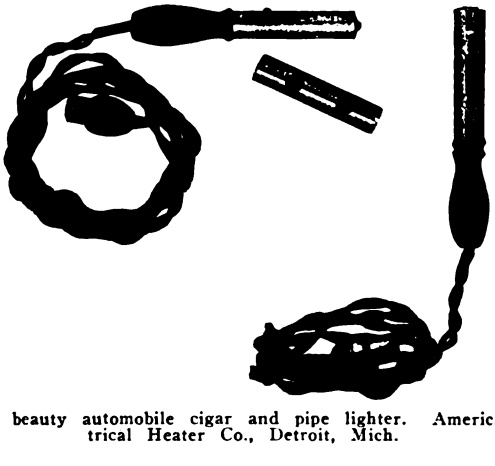
This device is designed for re-energizing the permanent magnets on the Ford car magneto. It may be operated from five or six dry cells in series, or an ordinary 6-volt storage battery. A large percentage of the ignition troubles on the Ford car are due to the weakening or demagnetizing of the permanent magnets on the magneto, which results in a much lower voltage output. This is more noticeable and annoying at low speed. By the use of this recharger on magnetos in this condition, the latter can be strengthened to such an extent that nearly full efficiency is again obtained. It is made by the Benjamin Electric Mfg. Co., 120-128 South Sangamon street, Chicago, Ill.



Ford Magnet recharger. Benjamin Electric Mfg. Co., 120-128 South Sangamon street, Chicago, Ill.

"American Beauty" Automobile Cigar and Pipe Lighter

This device is made for use with a 6-volt storage battery, with which the majority of gasoline automobiles and motor boats, are equipped. Either single or double point Edi-swan automobile plugs can be furnished so that the lighter can be used with either a two-wire or grounded system. The casing is heavily nickel plated and polished, and the handle is of wood, ebony finished. A push button at the side of the casing is used for turning on the current.



American beauty automobile cigar and pipe lighter. American Electrical Heater Co., Detroit, Mich.

A protector sleeve is furnished, which can be placed on the lighter, thus protecting the current from being accidentally turned on when not in use in the side pocket or on the seat; or the sleeve can be fastened to the body of the car and used as a holder as well as a protector for the lighter.

It is manufactured and sold by the American Electrical Heater Co., of Detroit, Mich.

Bobra Spark Plug

Dealers in electrical fittings who also handle automobile supplies, will note that the Bobra Spark Plug Co., of Dayton, Ohio, is now offering the new type of spark plug shown in the annexed cut. It is claimed to be one of the most reliable plugs now on the market. It is said to be easy to install and to possess unusual efficiency as a gas igniter.

Bobra spark plug. Bobra Spark Plug Co., Inc., Dayton, Ohio.

International Electric Glue Heater

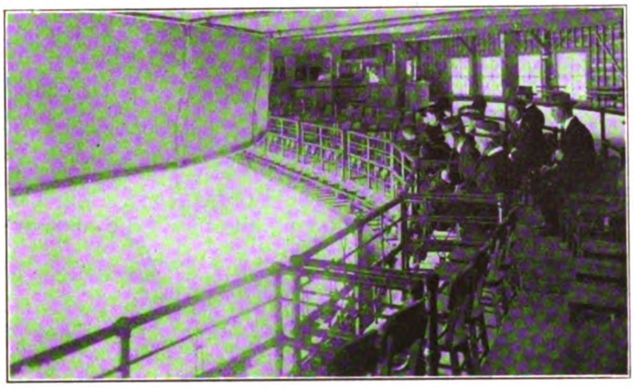
The International Electric Co., of Indianapolis, Ind., is in the market with a new line of electric glue heaters, the capacities ranging from 1 pint to 50 gallons.

Each section is spun from copper, without seams or joints, except the outer container of larger sizes, which is hand made. The glue pot is made with round bottom to facilitate cleaning. A hinged cover prevents evaporation, skin, skum, and dust forming on the glue, and aids in holding the glue at the proper temperature on low heat at minimum consumption of current. The outer container is made with a flange, to which is attached the bail when used as a portable heater, and which rests on the bench when used as a stationary heater, let into the top of the bench.

This heater is furnished complete with enclosed heating element properly insulated and connected to a three-heat indicating snap switch, and 6 feet of approved heater cord with separable attachment plug ready for connection to any lamp socket.

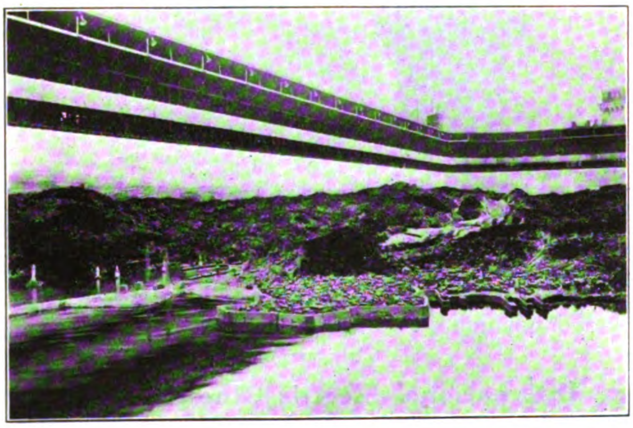
Combination Phonograph-Telephone Exhibit at San Francisco

One of the most popular exhibits at the Panama-Pacific Exposition at San Francisco is the large model of the Panama Canal. This model covers an area of 4½ acres. It was constructed from plans and drawings furnished by the Government. Within the building holding this exhibit is an oblong, sheltered amphitheatre surrounding the model, which lies depressed to such a depth as to make the ocean level about 25 feet below the spectator's eye. The general effect produced is a bird's-eye view not only of the canal, but also of the territory within and without the Canal Zone.



Circular observation railway equipped with telephone-phonograph apparatus.

In order to facilitate the inspection of this model, an endless moving platform circumnavigates it. This platform is 1,147 feet long and consists of 144 cars each 8 feet long. It is propelled by electric motors through a system of silent gears which mesh into a common rack and travels at a rate ot approximately 8 inches per second, or 28 minutes for an entire circuit of the amphitheatre.



View of canal model from overhead circular observation railway.

Each car is provided with seating capacity for seven passengers and the seats are so arranged as to give each passenger an unobstructed view of the panorama. A canvas canopy covers the entire platform, protecting spectators from sun and rain. The front of this canvas is dropped to a point that establishes a line of vision along the skyline of the panoramic walls on the opposite side. This compels concentration, on the part of the spectator, and also excludes all matter foreign to the panorama such as the continuation of the platform on the opposite side of the amphitheatre.

Each seat is equipped with a pair of Western Electric watch case telephone receivers attached to an adjustable handle, through which receivers one hears a continuous descriptive lecture as the trip is made around the canal model. This special type of handle was designed so that the spectators would not be obliged to hold their arms in an uncomfortable and tiresome position.

The source of the lecture heard through the receivers is a bank of sixty special Edison phonographs located in a nearby room. Each phonograph delivers its part of the lecture, recorded on Edison Blue Amberol cylinders, into Western Electric telephone transmitters, which in turn transmit it through a series of wires, contact rails, and other devices direct to the telephone receivers.

In each of the 15 lecture zones there are six individual contact rails in addition to a common return rail. Of these six individual rails there are three short ones (approximately 3 feet long), and three long ones, which extend the entire length of the lecture zone, one of each being provided for each of the three three-car trains which are in the lecture zone at one time. The short rails serve to start the phonograph motors, while the telephone transmission is gathered from the long rails. The common return rail before mentioned forms one side of all circuits. The wires leading to the phonograph equipment from each of the rails terminate in switching equipment on a phonograph unit equipped with four Edison phonographs of the cylinder type operating from a 110 volt, direct current power circuit. In this manner each car is connected with a phonograph, while the fourth or remaining phonograph of each group is held in reserve. As the car passes through each lecture zone, the phonograph-telephone set delivers a descriptiion of that part of the panorama at which the spectator is looking.

Electrically Propelled Battleship

The 30,000-ton battleship *California*, now building at the Brooklyn Navy Yard, will be operated throughout electrically. In addition to using electricity for cooking, steering, signalling, hoisting ammunition, turning turrets, operating winches, wireless, and ventilating apparatus, motors will be applied directly to the shafts driving the screws.

The *California* is the first large battleship to be equipped in this way. The excellent results obtained with the collier *Jupiter* induced the government to adopt this novel method of propelling its latest new superdreadnaught. The contract for the propelling equipment for the *California* has been recently awarded to the General Electric Co. The apparatus will cost about $431,000, as against an estimate of $631,000 for propelling by steam.

The equipment includes two 18,000-h.p., 2,200 r. p. m. turbine generators and four induction type motors. The maximum speed of the ship will be 22 knots per hour. It is estimated that 75 per cent. of the power generated by the turbines will be delivered at the generator, and that there will be a loss of only 8 per cent. in the electrical equipment. The efficiency of electric drive is far ahead of that of the most efficient steam drive now in existence on any of the large Atlantic liners.

A feature of electric propulsion not obtainable with steam propulsion is full power in backing. Full speed astern with electric propulsion means almost as many knots per hour as full speed ahead. This is an important military feature. If successful it promises to revolutionize the present methods of propelling all our warships.

AUTOMOBILE MATTERS

ELECTRIC VEHICLES—ELECTRICAL APPLIANCES FOR CARS, TRUCKS, AND GARAGES—NEWS AND ITEMS ABOUT THIS ACTIVE BUSINESS.

Last month, under the direction of several instructors from the Sheffield Scientific School, of Yale University, a 30-h.p. Franklin car was driven 55 miles on one gallon of gasoline. The run was continuous. The test was made as a part of the second annual Franklin national efficiency demonstration. This demonstration took place in the United States wherever Franklin agencies are established. Under the rules of the demonstration, only three persons, including the driver, could be carried in the car.

John F. Gilchrist, vice-president of the Commonwealth Edison Co. of Chicago, and president of the Electric Vehicle Association of America, addressed a joint meeting of the Electric Club of Chicago, the Chicago Section of the Electrical Association, and the Chicago Jovian League on April 22, on the subject of "The Electric Vehicle." The main argument at present used against electric cars, said Mr. Gilchrist, is that they will not go fast enough or far enough. The public heeds this argument because automobiles at present are used mainly for pleasure. Within the next ten years, he added, horses will have entirely disappeared from the city streets, and then the electric car, which can go far enough and fast enough for all commercial purposes, will come into its own.

A meeting of the New York Section of the Electric Vehicle Association was held in the auditorium of the Consolidated Gas Co. Building, 130 East 15th street, New York, on May 25. At this meeting a number of the manufacturers of electric vehicle charging apparatus gave demonstrations and explained the method of operating their chargers.

Arthur L. Willis, of Concord, N. H., has been appointed commissioner of motor vehicles for New Hampshire. This office was created by act of the last legislature and takes over the duties of automobile registration formerly performed by the office of secretary of state.

The Court of Common Pleas of Cuyahoga County, Ohio, has handed down a decision that will interest all public garage owners and operators. A woman owned a car and boarded it at the garage of the Baker Motor Vehicle Co. in Cleveland. The company furnished a driver at a fixed charge per hour whenever the woman ordered it. One evening, about dusk, the car ran into a dirt wagon standing in the roadway without a signal lantern on it. The collision intured the woman, who was riding back of the driver. The court charged the jury that, as a matter of law, the driver of the car was, at the time of the accident, the agent and servant of the Baker company and that if the company had not exercised due care in selecting a careful driver, or if the driver was negligent and his negligence caused the accident, the company was liable. This ruling of the Court is probably the first of its particular kind and if sustained by the higher courts means, as a practical matter, that a garage owner or other person who supplies drivers to the owners of cars, in the manner above described, is absolutely liable not only to the owner of the car but to third parties as well who may be injured through the carelessness of the driver.

A large attendance of motor-truck manufacturers, engineers and sales managers opened the motor-truck convention held at the Statler Hotel, Detroit, Mich., May 5 and 6, under the auspices of the National Automobile Chamber of Commerce. The programme was arranged under the direction of the commercial vehicle committee. Among the papers was one on "Why Service Conditions Should Be Investigated and Recommendations Made Before Selling a Customer," by Mr. Vernon Munroe, president International Motor Co.

At a recent meeting of the New York Section of the Electric Vehicle Association David Beecroft, editor of the *Commercial Vehicle*, said that the big gasoline interests make it easy and economical for the owner living in the small village with his private garage. They will sell and deliver gasoline to him at any time and in small quantities and charge him not more than one cent per gallon advance on the lowest rate that our big metropolitan garage men can purchase it at. For years, some of our largest gasoline supplying companies have been working assiduously to develop this field. Today, the gasoline service to the private garage is as easy as the service of purchasing groceries over the telephone and having them delivered a little later at the kitchen door. Today, it is no trouble to buy gasoline. There were times when the tourist traveling from New York to Chicago encountered difficulties. He had to purchase different grades of gasoline in different cities. There was not a standard gravity. It made touring a little difficult rather than easy. It is years, however, since this difficulty has been overcome, and now one can secure the same gravity of gasoline along three different highways from New York to the Pacific Coast. It is difficult, he added, to see that the central station people have been so active, and that they are doing anything like their share in the great problem of making it easier to own an electric car. They are not bringing the electric current to one's door, as is the gasoline man. True, we have some ideal electric garages, but this is little credit. We cannot run the electric car to the garage every time we should and charge a little in order to get all of the desired mileage. We must bring the electric current to the places our electric cars frequent, and if we are to develop the electric car business as it should be, then we must bring the electric current to the many places that our electric cars should frequent.

National Electric Light Convention

The thirty-eighth convention of the National Electric Light Association will be held at San Francisco, Cal., from June 8 to 11, 1915. Convention headquarters will be in the Native Sons of the Golden West Building, at 414 Mason street, San Francisco. The association office and registration headquarters will be in the ground-floor lobby. On this floor is the auditorium. The social hall, which is in the basement, will accommodate 700 or 800 people. The general, technical, and commercial sessions will be divided between these two halls under such arrangement as is best in accordance with the program. The public policy meeting will be held in the auditorium, which, with a balcony, will accommodate from 1200 to 1500 people. The sessions of the accounting section will be held in a large room in front on the fourth floor. In another room on the same floor will be exhibits of the meter committee, the accounting committee, the company section committee, and the commercial section, while a large room will be provided for the transportation committee, which will serve also for the local committees and as a general lounging room. A room on the fifth floor will be reserved for the *Convention Daily* and the association stenographic staff.

A large amount of business is presented for consideration, and most of it is of an important character. At first it was proposed to crowd the work into three days, but various reasons forbade limiting the sessions to Tuesday, Wednesday and Thursday; and the extra sessions will therefore allow the subject-matter to be treated in a more leisurely way, favorable to fuller discussion. Moreover, as the special trains do not pull out on their return trips until Saturday and Sunday, good use is thus made of some of the intervening time.

Another feature of interest is the proposed shifting of the public policy meeting from Wednesday to Thursday evening, owing to the difficulty in securing a suitable hall for Wednesday night. Usually at the N. E. L. A. conventions for many years past there have been no sessions on Wednesday afternoon, because of the objection to holding the delegates together for sessions morning, afternoon and evening, which would make a strenuous and exhausting day. With the public policy meeting on Thursday evening, the afternoon recess will also fall on that day, and as there will be no baseball match this year, the afternoon will be devoted, by invitation of the exhibition committee, to an official visit of the convention to the electrical exhibits at the Panama-Pacific Exposition.

Several special trains will run from the East. Arrangements for traveling on these trains should be made direct with N. E. L. A. headquarters at 29 West 39th street, New York.

TUESDAY, JUNE 8, 10 A. M.
FIRST GENERAL SESSION

1. Welcome to the City, Mayor Rolph.
2. Welcome to the Coast, John A. Britton.
3. Address of President Scott.
4. Announcements.
5. Report of Committee on Organization of the Industry, Geo. Williams.
6. Report of the Secretary, T. C. Martin.
7. Report of Insurance Expert, W. H. Blood, Jr.
8. Report of Committee on Progress, T. C. Martin.
9. Report on *Question Box*, S. A. Sewall.
10. Report of Committee on Education, J. F. Gilchrist.
11. Paper. "Revivals," Paul Lüpke.

TUESDAY, 2:30 P. M.
FIRST TECHNICAL SESSION

1. Report of Committee on Meters, C. G. Durfee.
2. Report of Committee on Electrical Apparatus, L. L. Elden.
3. Report of Committee on Grounding Secondaries, Paul Spencer.
4. Paper, "Application of the Diversity Factor," H. B. Gear.
5. Address, "Features of the Lighting of the Panama-Pacific Exposition," W. D'A. Ryan.

TUESDAY, 2:30 P. M.
FIRST ACCOUNTING SESSION

1. Chairman's Address, H. M. Edwards.
2. Report of the Library Committee, E. J. Allegaert.
3. Report of the *Question Box* Committee, E. C. Scobell.
4. Report of the Committee on N. E. L. A. Uniform System of Accounts, J. L. Bailey.
5. Paper, "Some Opportunities of Public Utility Accountants," L. H. Reynolds.

TUESDAY, 2:30 P. M.
FIRST COMMERCIAL SESSION

1. Chairman's Address and (2) Report of Committee on Foreign Relations, Douglass Burnett.
3. Report of Commercial Section Finance Committee, J. F. Becker.
4. Report of Membership Committee, J. G. Learned.
5. Report of Publications Committee, E. A. Edkins; and (5a) Report of Sub-Committee on Salesman's Handbook, C. J. Russell.
6. Report of Committee on Education of Salesmen, F. R. Jenkins.
7. Report of Committee on Commercial Department Terminology, M. E. Turner.

WEDNESDAY, JUNE 9, 10 A. M.
FIRST HYDRO-ELECTRIC AND SECOND TECHNICAL SESSION

1. Address of Chairman of Hydro-Electric Committee, M. R. Bump.
2. Report of Committee on Hydro-Electric and Transmission Progress, T. C. Martin.
3. Report of Committee on Prime Movers, I. E. Moultrop.
4. Paper, "Practice in High-Head Hydraulic Plants," J. P. Jollyman.
5. Paper, "Analysis of Governor Effort," E. D. Searing.
6. Paper, "Water Power Development on the Pacific Coast," P. M. Downing.

Paper, "Oil Burning Standby Plants," C. H. Delany.

WEDNESDAY, 10 A. M.
SECOND COMMERCIAL SESSION

1. Address, C. C. Moore, President Panama-Pacific Exposition.
2. Report of Power Sales Committee on Typical Power Sales Development in the West, J. H. McDougal.
3. Report of Committee on Merchandising and Recent Development of Electric Appliances, R. R. Young.

WEDNESDAY, 10 A. M.
SECOND ACCOUNTING SESSION

1. Paper, "Workmen's Compensation Insurance," R. J. Sullivan.
2. Paper, "Electric Vehicle Cost Accounting," W. P. Kennedy.
3. Paper,
4. Paper, "Record of Property or Construction Expenditures," P. R. Ferguson.

WEDNESDAY, 12:30 P. M.
BRIEF EXECUTIVE SESSION

WEDNESDAY, 2:30 P. M.
THIRD COMMERCIAL SESSION

1. Report of Lamp Committee, F. W. Smith.
2. Report of Committee on Wiring of Existing Buildings, R. S. Hale.

WEDNESDAY, 2:30 P. M.
SECOND HYDRO-ELECTRIC AND THIRD TECHNICAL SESSION

1. Report of Committee on Overhead Line Construction, Thos. Sproule.
2. Paper, "Overhead Line Construction on the Coast," J. C. Martin.
3. Report of Hydro-Electric Sub-Committee on High-Tension Transmission and Construction, R. J. McClelland.
4. Report of Hydro-Electric Sub-Committee on High-Tension Apparatus, W. N. Ryerson.
5. Report of Hydro-Electric Sub-Committee on Main Line Electrification of Railroads, B. F. Wood.

THURSDAY, JUNE 10, 10 A. M.
THIRD ACCOUNTING SESSION

1. Report of Committee on Cost Accounting, J. H. Gulick.
2. Paper,
3. Paper, "Analytical Accounting for Central Station Purposes," O. B. Coldwell.
4. Presentation and Adoption of New Accounting Section By-Laws.
5. Report of the Nominating Committee.
6. Installation of Section Officers.
7. Adjournment.

THURSDAY, 10 A. M.
FOURTH COMMERCIAL SESSION

1. Report of Rate Research Committee, R. S. Hale.
2. Report of Power Sales Bureau of the Commercial Section, C. J. Russell.
3. Paper, "The Commercial Application of Resistance Furnaces," C. W. Bartlett.
4. Paper, "A Stassano Furnace Installation at Redondo, Cal.," W. M. McKnight.
5. Paper, "Electric Furnace Power Loads," F. T. Snyder.
6. Paper, "Charges for Electric Welding Service," C. K. Nichols.

THURSDAY, 10 A. M.
FOURTH TECHNICAL SESSION

1. Report of Committee on Terminology, A. S. McAllister.
2. Report of Committee on Street Lighting, J. W. Lieb.
3. Report of Committee on Underground Construction, P. Torchio.
4. Paper,
5. Report of Committee on Accident Prevention, M. J. Insull.
6. Paper, "Opportunities of the Public Service Companies in General Accident Prevention," C. B. Scott.
7. Adjournment.

THURSDAY, 8:45 P. M.
PUBLIC POLICY MEETING

1. Reading Report of the Public Policy Committee, W. W. Freeman.
2. Address, "Public Service Commission Relationships," John H. Roemer.

FRIDAY, JUNE 11, 10 A. M.
FIFTH COMMERCIAL SESSION

1. Report of Committee on Power Sales Methods: Demonstration of a Power Sale, C. H. Stevens.
2. Completion of Unfinished Business.
3. Report of Section Nominating Committee.
4. Election of Section Officers.
5. Adjournment.

FRIDAY, 10 A. M.
SECOND GENERAL AND EXECUTIVE SESSIONS

1. Report of Committee on Company Sections, F. J. Arnold.
2. Paper, "Company Section Work," D. C. Bruce.
3. Paper, "The Electric Vehicle and the Central Station," J. F. Gilchrist and A. J. Marshall.
4. Address, "Electrical Prosperity Week," J. M. Wakeman.
5. Report of Committee on Doherty and Billings Prizes for Company Section Papers, P. Lüpke.
6. Report of the Committee on Memorials, T. C. Martin.
7. Report of Committee on President's Address.
8. Report of Committee on Resolutions.
9. Report of Nominating Committee.
10. Election of Officers.
11. Adjournment.

Awards of the Franklin Medal

The Franklin Medal, the highest recognition in the gift of The Franklin Institute of the State of Pennsylvania, has recently been awarded to Heike Kamerlingh Onnes and to Thomas Alva Edison. The awards were made on the recommendation of the Institute's Committee on Science and the Arts, that to Onnes being in recognition of his "long-continued and indefatigable labors in low-temperature research which has enriched physical science, not only with a great number of new methods and ingenious devices, but also with achievements and discoveries of the first magnitude." That to Edison is in recognition of "the value of numerous basic inventions and discoveries forming the foundation of world-wide industries, signally contributing to the well-being, comfort and pleasure of the human race."

The medal awarded to Prof. Onnes was received on his behalf by Chevalier van Rappard, minister from the Royal Netherlands Government, at the stated meeting of the Institute on the evening of Wednesday, May 19. At this meeting Mr. Edison was the guest of the Institute and received his award in person.

Edison Medal for Alexander Graham Bell

Dr. Alexander Graham Bell, inventor of the telephone, was formally presented with the Edison Medal at the annual meeting of the American Institute of Electrical Engineers at 29 West 39th street, New York, on the evening of May 18. Thomas A. Watson, who was Dr. Bell's assistant in the days when the telephone was a nursling, reviewed the history of the art of telephony. The Edison Medal fund was established about ten years ago by a group of men interested in perpetuating the name and genius of Edison as an inventor. The medal is awarded each year by a committee consisting of twenty-four members of the Institute to a resident of the United States of America and its dependencies or of the Dominion of Canada, "for meritorious achievement in electrical science or electrical engineering or the electrical arts."

The 1915 edition of Berly's Universal Electrical Directory has just been issued. It contains 1,554 pages. As usual this directory contains a record of all the industries directly and indirectly connected with electricity and magnetism, also the names and addresses of manufacturers of all kinds of electrical apparatus.

MOTOR MARKETS

USES FOR MOTORS, GROUPED ACCORDING TO STATED HORSE-POWER LIMITS.

Motors of from 7½ to 15 Horse Power

[MOTOR DRIVE SERIES—ARTICLE NO. 44]

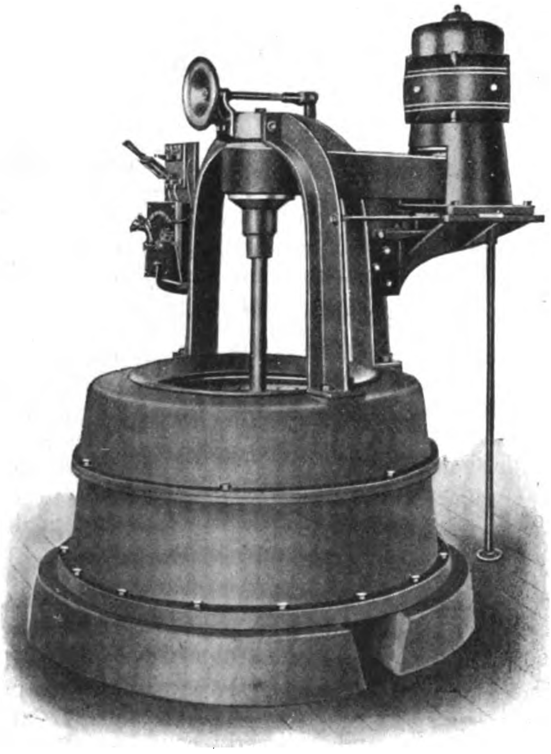
Preceding Articles

January, 1915	Classification of Motors
February, 1915	1/10 Horse Power and Less
March, 1915	⅛ to ¼ Horse Power
April, 1915	⅓ to 1 Horse Power
May, 1915	1½ to 5 Horse Power

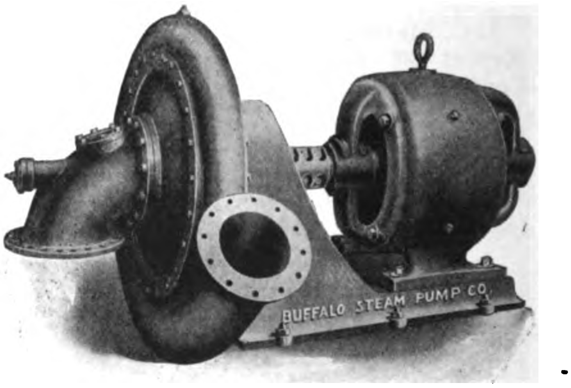
The accompanying table lists two hundred devices capable of being individually driven by motors of from 7½ to 15 horse power. Group drive is not considered. Such motors operating devices in groups could be used for driving practically all the devices mentioned in the previous tables of this series. The table, therefore, represents the market for motors of from 7½ to 15 horse power for driving devices individually.

Up to 5 horse power, motors are usually required for operation on 110 and 220 volts. Above five horse power, however, it is frequently the case that the motors are required to operate on 440 volts alternating current.

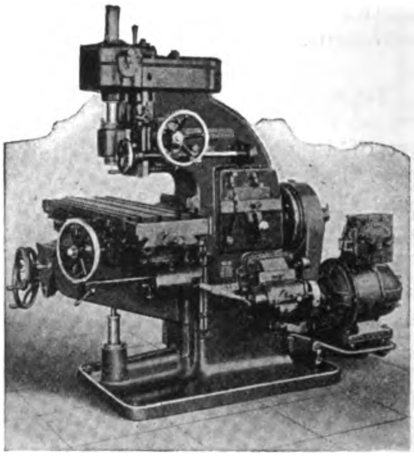
Many of the devices mentioned in the table are illustrated, the caption under each cut giving information as to the horse power, voltage, and speed of the motor operating, and where possible, the name of the maker of the machine operated, and its size or capacity.



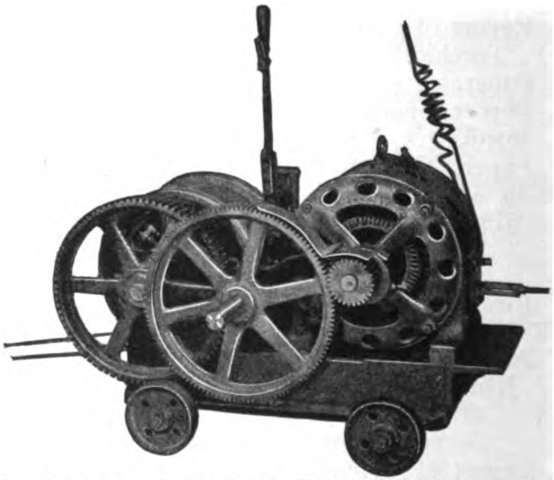
7½ h.p., 800 r.p.m., direct current vertical motor driving hydro-extractor. The Mechanical Appliance Co., Milwaukee, Wis.



15 h.p., motor, made by The Peerless Electric Co., Warren, Ohio, direct coupled to a high duty centrifugal pump, made by Buffalo Steam Pump Co., Buffalo, N. Y.



10 h.p., 1150 r.p.m., direct current motor, made by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., driving a No. 3 Browne & Sharpe, vertical spindle boring mill.



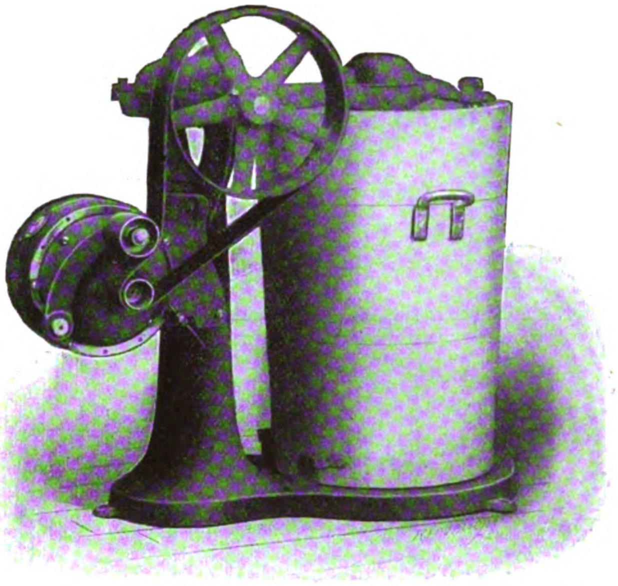
7½ h.p., 1750 r.p.m., constant speed, Century single phase motor geared to a builders' hoist; motor runs continuously, starting and stopping of hoist being controlled by a clutch. Century Electric Co., 19th, Pine, and Olive streets, St. Louis, Mo.

200 Uses for Motors of From 7½ to 15 Horse Power

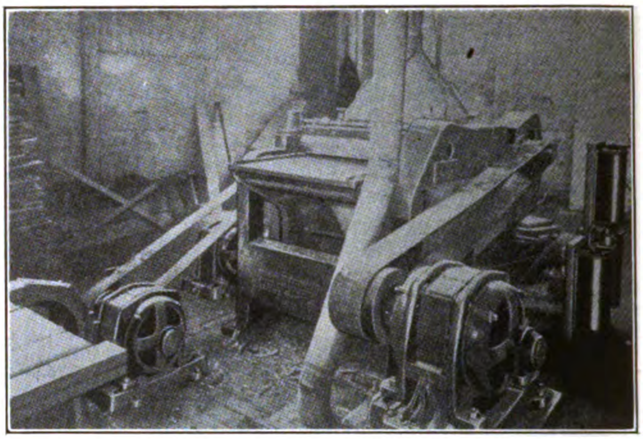
The following devices are capable of being individually driven by motors of from 7½ to 15 horse power, usually on 110 or 220 volts, though very often required to operate on 440 volts alternating current:

Air compressors
Ammonia compressors
Angle shears, metal
Arch bar drills
Axle lathes
Baling presses
Band saws
Bar pullers, metal
Barley bleachers
Bending rolls, metal
Bolt heading machines
Bolt and nut machines
Book embossing machines
Borax conveyors
Boring mills
Bottling machines
Brine pumps
Bucket carriers (conveyors)
Builders' hoists
Bulldozers
Carding machines
Carousels
Carpet cleaners
Casein grinders
Casting cleaners
Casting rattlers
Chemical grinders
Chocolate rolling machines
Chop mills, feed
Circle swings
Clay crushers
Clay machines
Clipping shears, metal
Coal conveyors
Coal cutters
Coke drawers
Concrete mixers
Cooling racks, metal
Core hoists, foundry
Corn crushers
Cotton pickers
Cotton washers
Cracker dough mixers
Crane bridges
Cranes
Crank shapers
Cream beaters, candy
Cross rolls, metal
Cupola blowers
Cutoff saws
Cutters, book
Cylinder borers
Double crank presses
Dough dividers, bakers'
Dough mixers
Dovetailers, woodworking
Draw presses
Drill presses
Drills
Dry pans
Dryers, cement
Edging saws, woodworking
Embossing machines
Engine lathes
Extractors, laundry
Facing machines, paper
Feather crushers
Feather renovators
Feed mills
Fillers and weighers
Filters, brewery
Flaking rolls, cereal
Flooring machines
Flour sifters
Freight elevators
Gainers, woodworking
Gate valves
Gear cutters
Grain dryers, brewery
Grain mills
Grain separators
Grease fillers
Grease mixers
Grinders, glass
Grinding mills, brewery
Grooming machines
Gypsum grinders
Hammers, power
Hide wringers, tanneries
Hog hoists
Hoists, freight
Hop machines
Hydraulic presses
Hydro-extractors
Ice cream freezers
Ice grinders
Ice machines
Ink mills
Jointers, wood
Junk shears
Keg washers
Key seating machines
Kiss pullers, candy
Lard presses
Larries, coal mining
Lathes, metal
Lears, glass
Lithographing presses
Loaf molders, bakeries
Malt mills
Mangles, textile
Marble surface grinders
Mash tubs
Mash tub agitators
Matchers, woodworking
Meat choppers
Merry-go-rounds
Milling machines
Mine fans
Mine locomotives
Mine pumps
Mining machines, coal
Molders, woodworking
Molding machines, foundry
Mortisers, woodworking
Newspaper presses
Oat cleaners
Oat clippers
Oil presses
Oil pumps
Oven conveyors
Paint mixers
Passenger elevators
Pickle wheels, tanneries
Pigskin paddle vats
Pipe drawing machines
Planers, metal
Polishing machines
Priming pumps
Printing presses
Pug mills, finishing
Pulverizers
Punch and shears
Racking pumps, brewery
Radial drills
Rail benders
Rail grinders
Refrigerating machines
Resaws
Rice cookers, brewery
Rip saws
Rolls, metal
Rounders and backers
Routers, electrotyping
Rubbing beds, stone
Sanders
Sash stickers, woodworking
Sausage grinders
Saws, metal
Scrap shears
Shapers
Shaving exhausters
Shears
Size rolls, metal
Slotters, metal
Soakers and conveyors
Soap plodders
Squaring shears, metal
Spindle shapers
Spinning frames
Splitting shears, metal
Stickers, woodworking
Stone saws
Straightening rolls
Sugar mills, candy
Sugar pulverizers
Surfacers, woodworking
Table leg machines
Tenoners, woodworking
Tire benders
Toggle presses
Traveling cranes
Trimming presses
Tubing machines, rubber
Tumbling bars, foundry
Tumbling mills, machine
Turbine pumps
Turntables
Turret lathes
Upsetting machines
Vacuum cleaners, stationary
Vacuum pumps
Valves
Variety saws
Ventilating fans
Wash drums, tanneries
Washing machines, laundry
Wheel presses
Winches
Wood platers

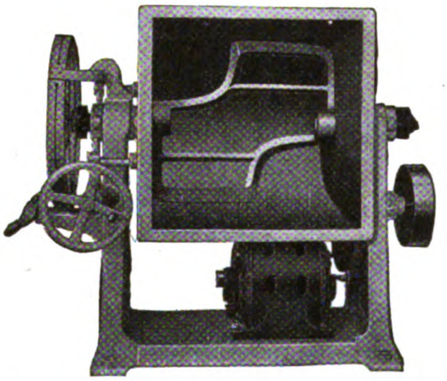
The illustrations accompanying this table show how motors are used for operating a number of these devices.



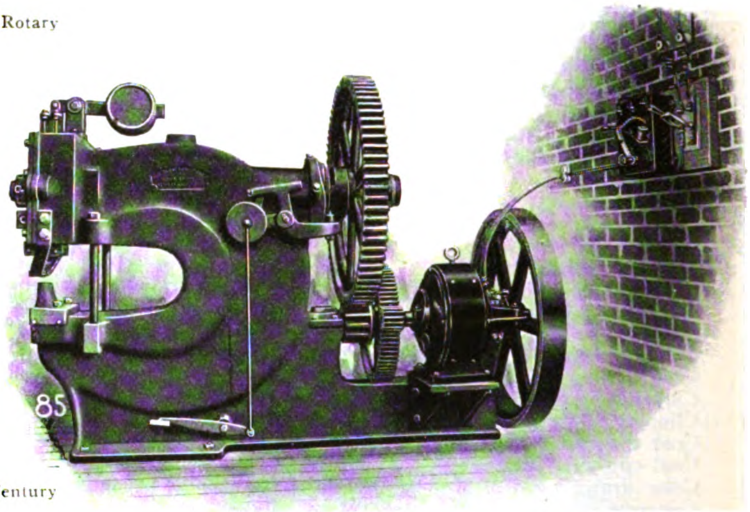
Ice cream freezer driven by d.c. motor, with idler. American Rotary Valve Co., 156 North Dearborn street, Chicago.



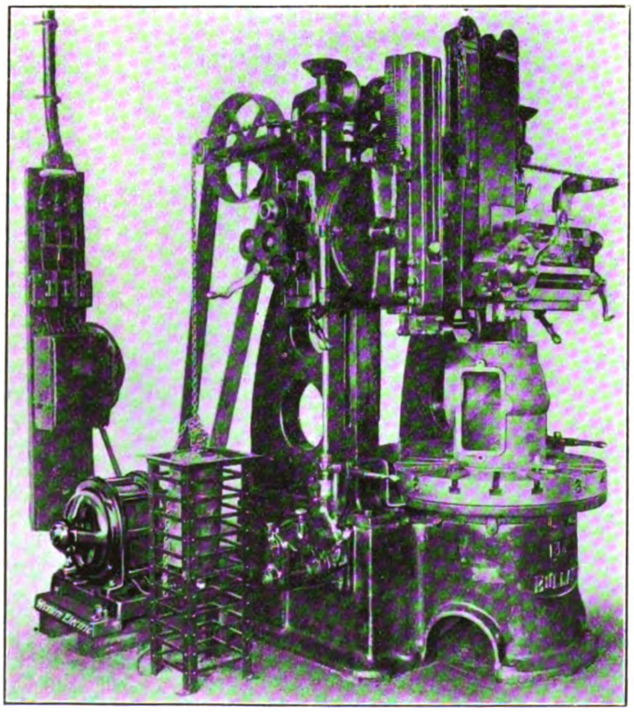
Double head pony planer, in plant of Paine Lumber Co., Oshkosh, Wis., driven by three 7½ h.p., induction motors, made by General Electric Co., Schenectady, N. Y.



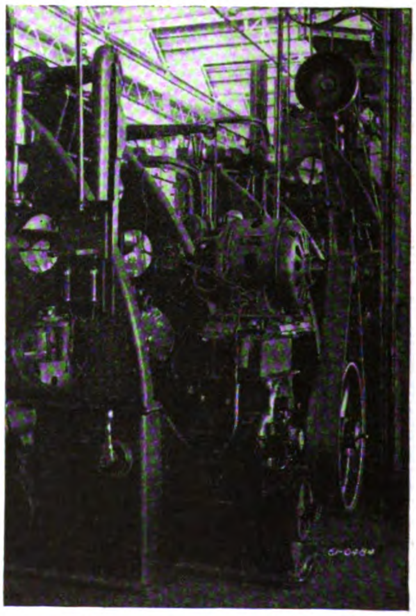
7½ h.p., 1750 r.p.m., Century single phase motor, made by Century Electric Co., 19th, Pine, and Olive streets, St. Louis, Mo., geared to a dough mixer.



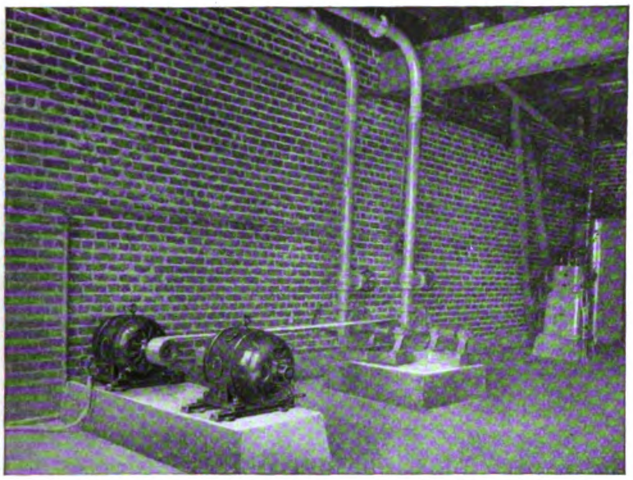
7½ h.p., direct current motor, made by The Robbins & Myers Co., Springfield, Ohio, direct connected to a punch press.



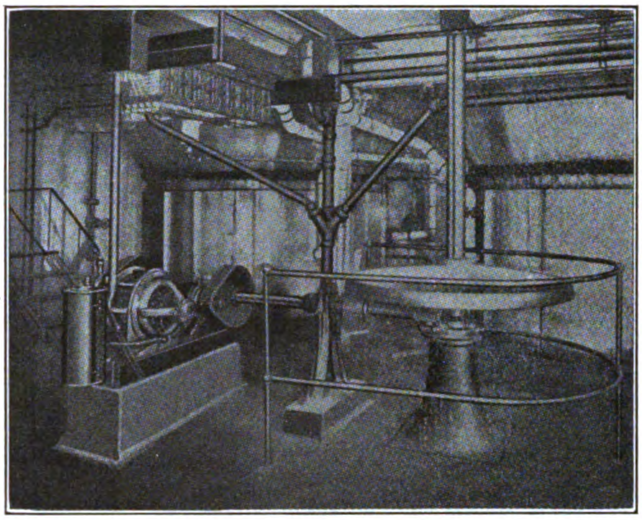
10 h.p. motor, made by Western Electric Co., 463 West street, New York, operating a Bullard boring mill.



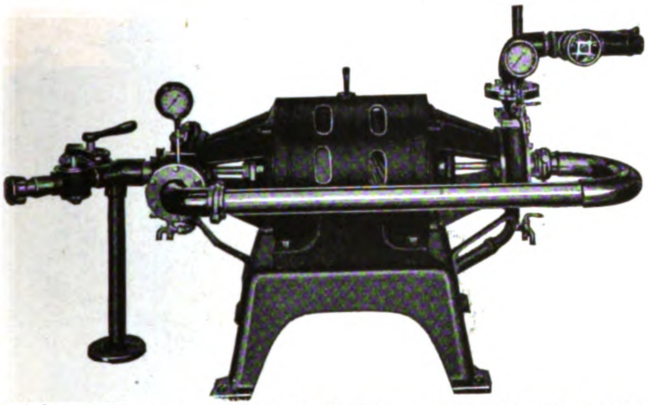
7½ h.p., unity power factor type motor, made by Wagner Electric Mfg. Co., 6400 Plymouth avenue, St. Louis, Mo., driving a boring mill.



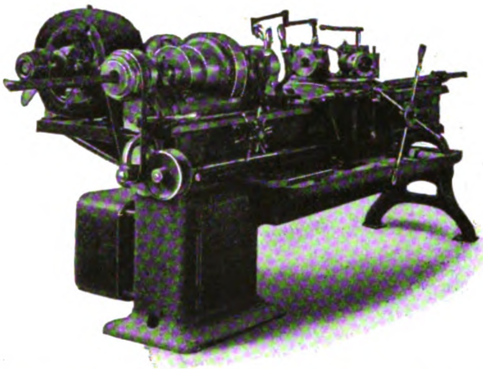
Two 10 h.p., starterless, polyphase motors, made by Wagner Electric Mfg. Co., 6400 Plymouth avenue, St. Louis, Mo., operating centrifugal pumps.



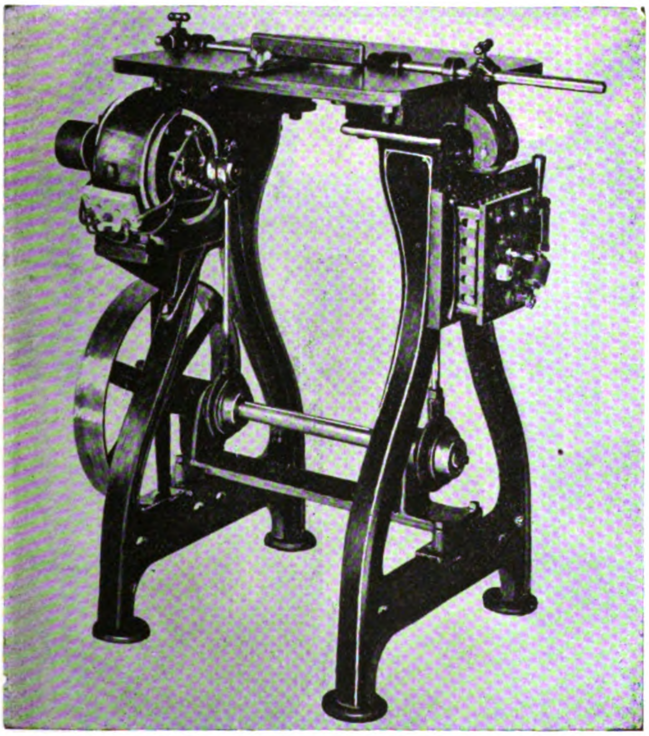
15 h.p., back geared motor, made by General Electric Co., Schenectady, N. Y., driving 300 barrel mash tub, Bartholomay brewery, Rochester, N. Y.



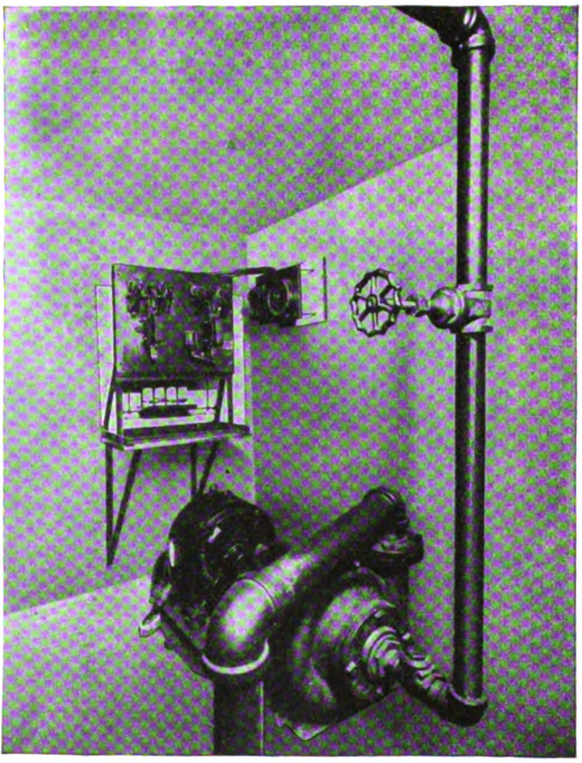
7½ h.p., 3500 r.p.m., constant speed, Century single phase motor direct connected to a centrifugal pump for handling beer. Century Electric Co., 19th, Pine, and Olive streets, St. Louis, Mo.



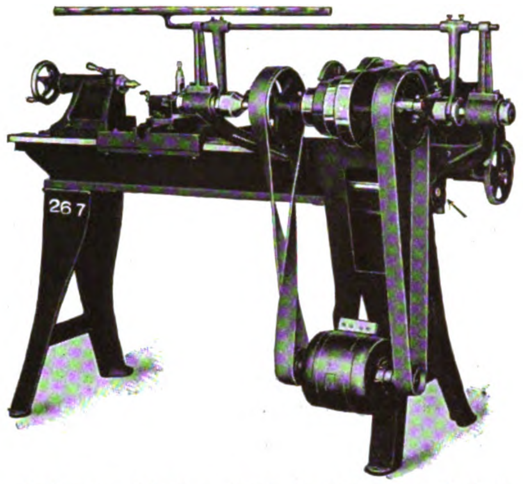
7½ h.p., adjustable speed motor, made by The Peerless Electric Co., Warren, Ohio, geared to a turret lathe, made by Jones & Lamson Co., Springfield, Vt.



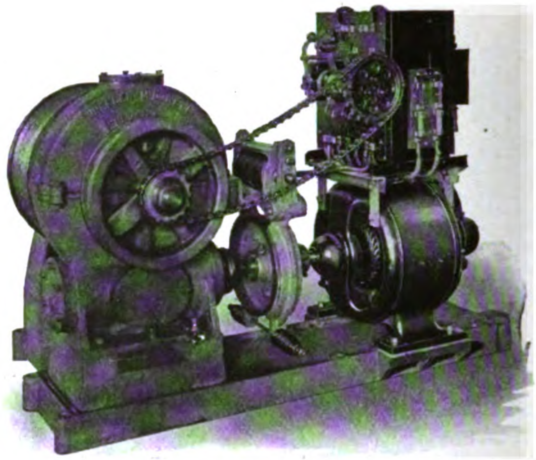
Paper box machine, made by M. D. Knowlton Machinery Co., Rochester, N. Y., belted to motor, made by the Peerless Electric Co., Warren, Ohio.



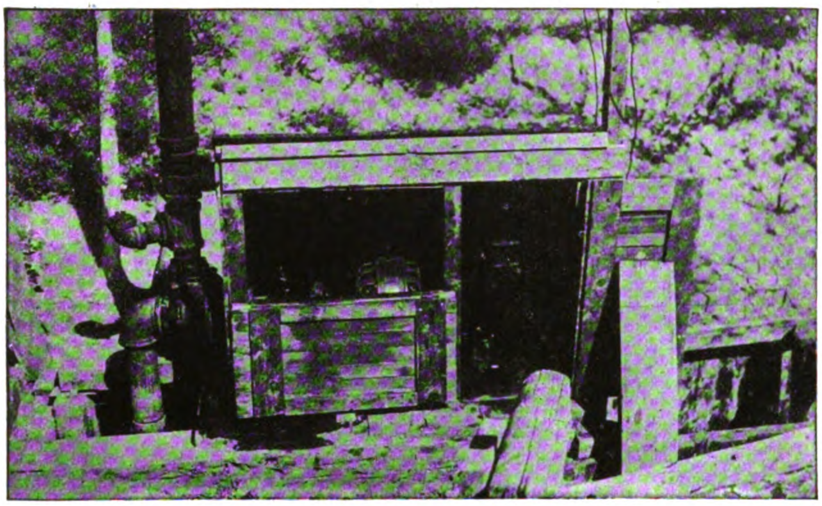
15 h.p., squirrel cage, induction motor, made by The Lincoln Electric Co., Cleveland, Ohio, direct connected to a Thomas & Smith centrifugal pump.



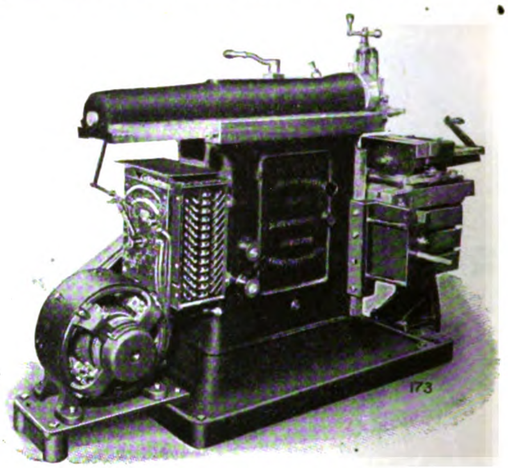
7½ h.p., Rothmotor, belted to South Bend Machine Tool Co. lathe. Roth Bros. & Co., Adams & Loomis streets, Chicago.



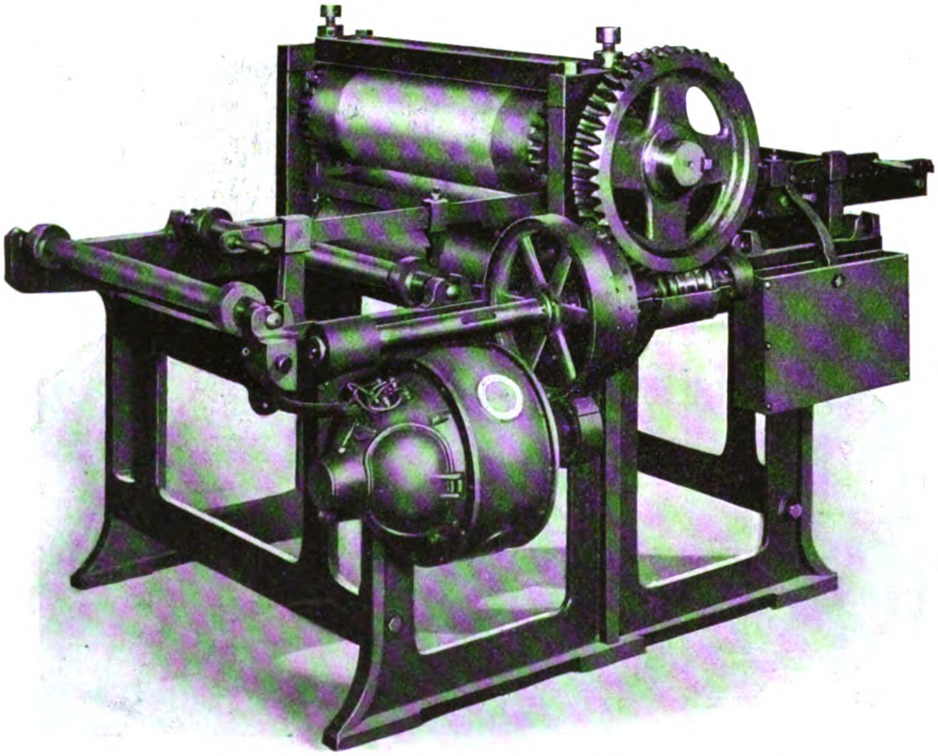
7½ h.p., 800 r.p.m., direct current motor operating elevator mechanism. The Mechanical Appliance Co., Milwaukee, Wis.



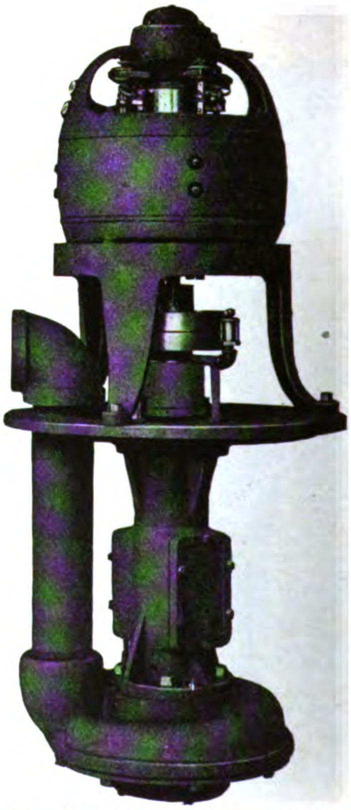
10 h.p., motor made by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., operating irrigation pump, for irrigating 60 acres of land.



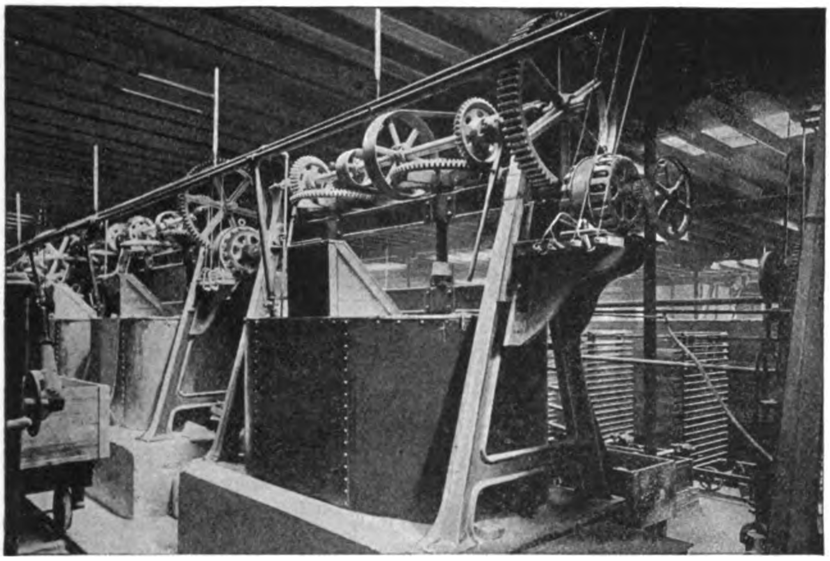
7½ h.p. Rothmotor geared to an Averbeck shaper. Roth Bros. & Co., Adams and Loomis streets, Chicago.



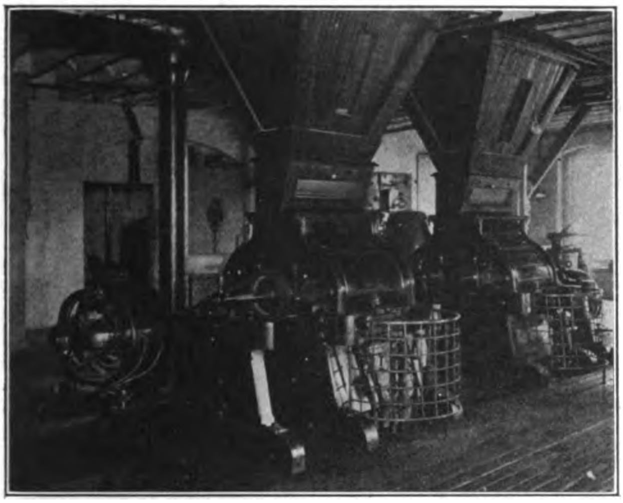
Matrix roller geared to a direct current motor, made by American Rotary Valve Co., 156 North Dearborn street, Chicago.



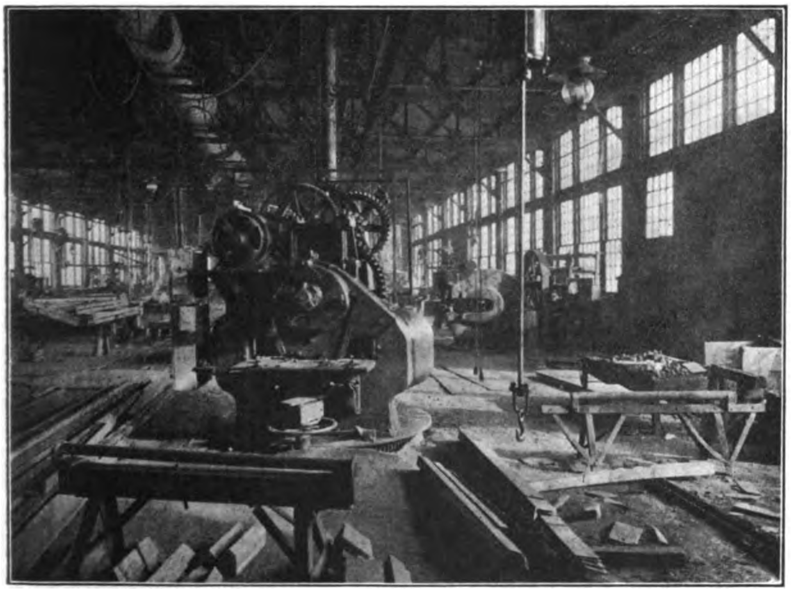
10 h.p., 1050 r.p.m., direct current motor driving vertical pump. The Mechanical Appliance Co., Milwaukee, Wis.



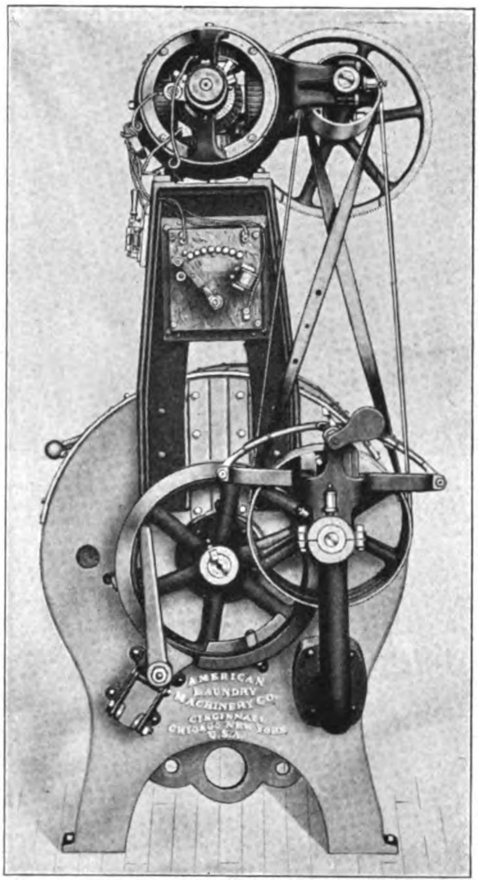
15 h.p., alternating current motors, made by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., geared to double blungers in plant of J. B. Owens Pottery Co., Zanesville, Ohio.



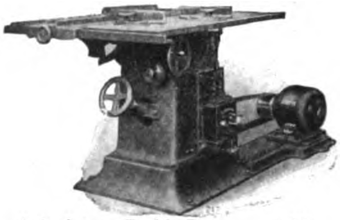
Two, 15 h.p., direct current motors, made by Crocker-Wheeler Co., Ampere, N. J., driving malt mills in Beadleston & Woerz brewery, New York.



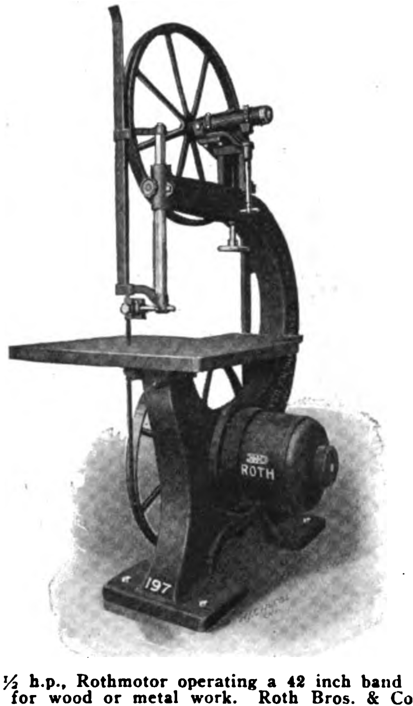
15 h.p., squirrel cage motor, made by The Lincoln Electric Co., Cleveland, Ohio, geared to a shear.



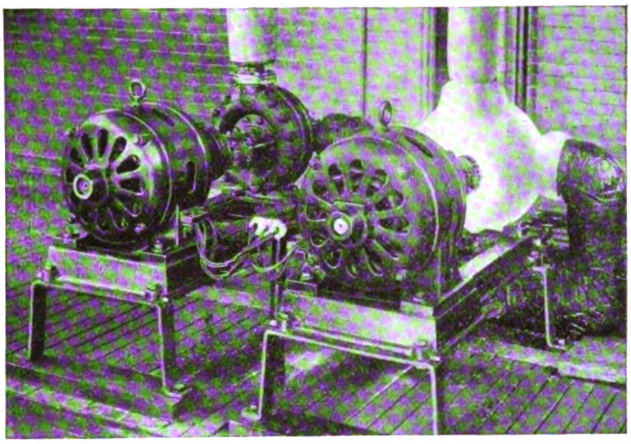
Rotary washer, made by American Laundry Machinery Co., Rochester, N. Y., direct belted to back geared motor, made by The Peerless Electric Co., Warren, Ohio.



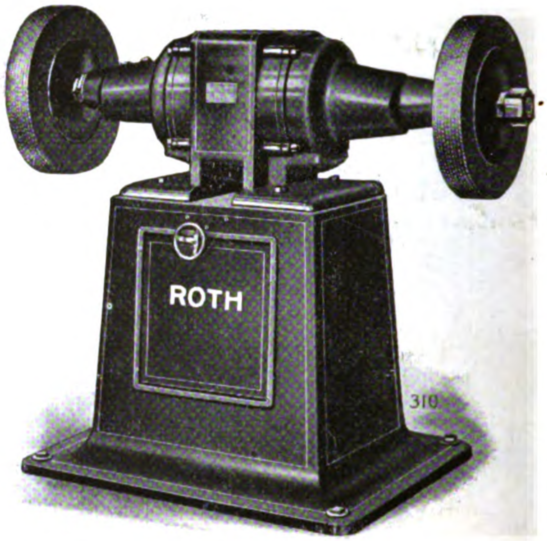
7½ h.p. Rothmotor belted to a B. M. Root saw table. Roth Bros. & Co., Adams and Loomis streets, Chicago.



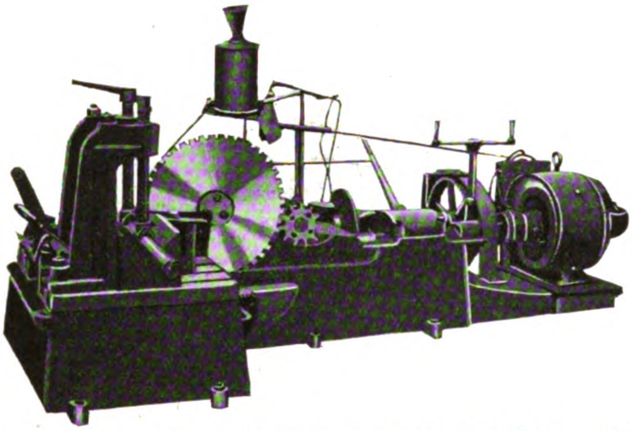
7½ h.p., Rothmotor operating a 42 inch band saw for wood or metal work. Roth Bros. & Co., Adams & Loomis streets, Chicago.



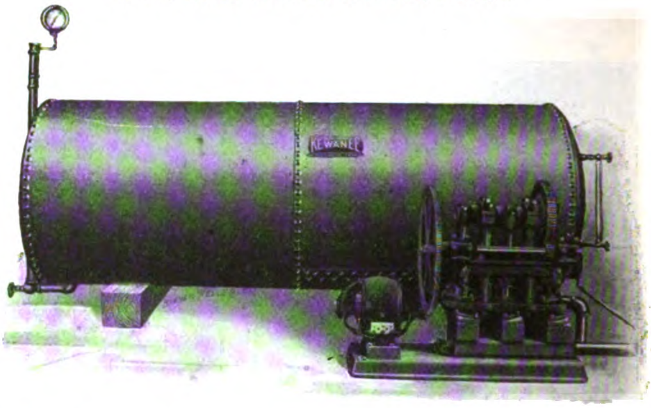
Two 7½ h.p., 3 phase, 60 cycle, 1720 r.p.m. motors, made by Wagner Electric Mfg. Co., 6400 Plymouth avenue, St. Louis, Mo., operating brine pumps in an ice plant.



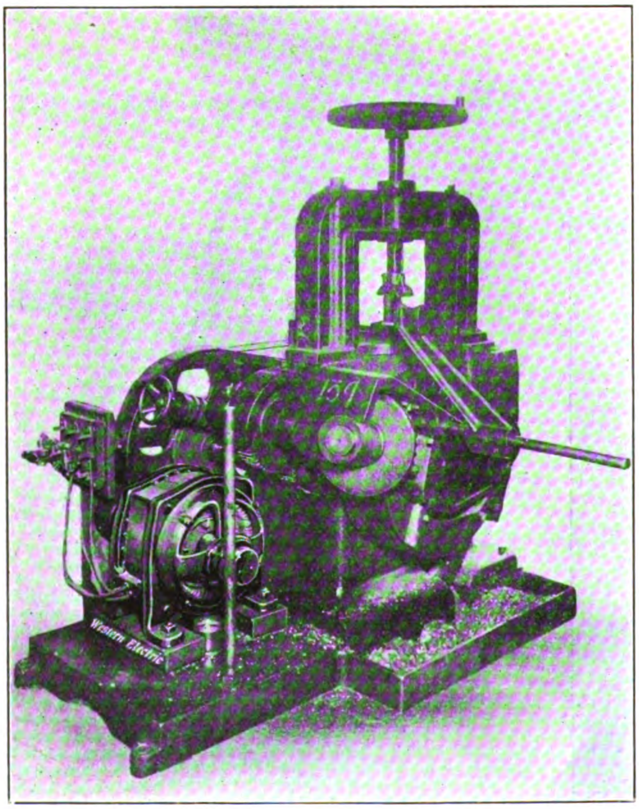
7½ h.p., 1720 r.p.m., 3 phase, 60 cycle, Rothmotor polisher. Roth Bros. & Co., Adams and Loomis streets, Chicago.



10 h.p. motor, made by The Peerless Electric Co., Warren, Ohio, geared to a cold saw, made by the Q. & C. Co., New York.

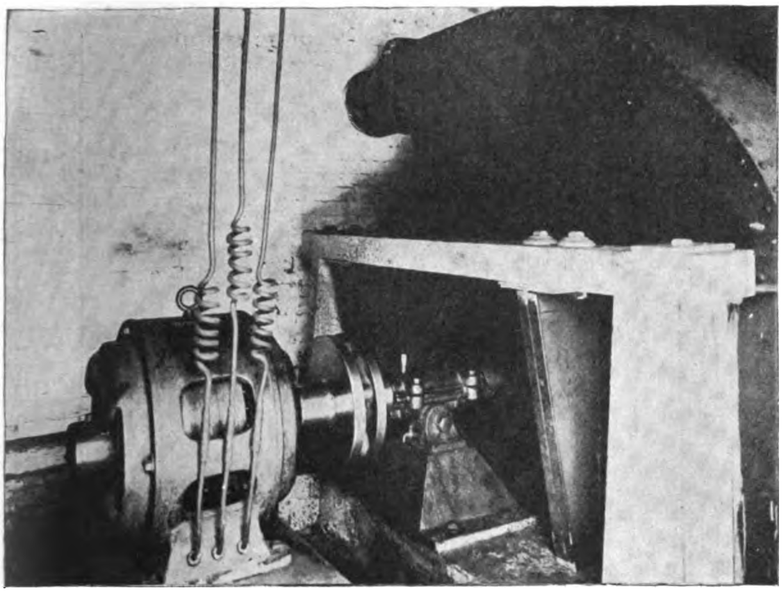


7½ h.p. motor, made by The Peerless Electric Co., Warren, Ohio, geared to a pneumatic water supply system, made by Kewanee Water Supply Co., Kewanee, Ill.

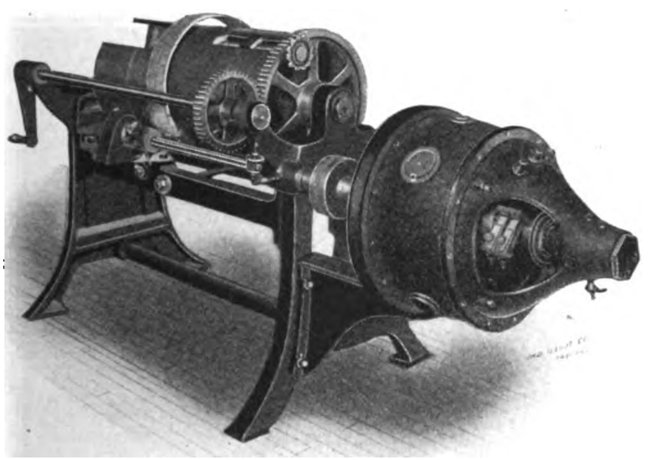


7½ h.p. induction motor, made by Western Electric Co., 463 West street, New York, direct connected to a metal saw.

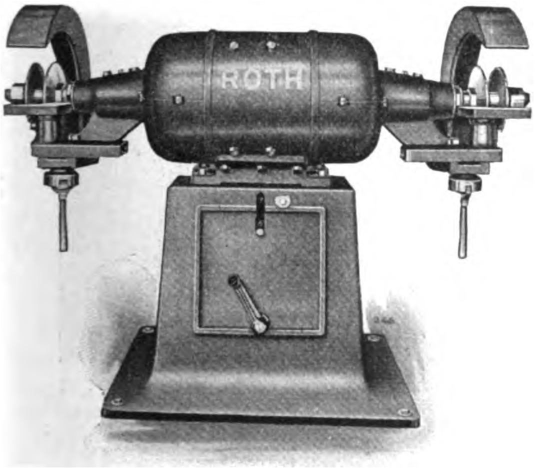
7½ h.p., 1200 r.p.m., motor, made by The Lincoln Electric Co., Cleveland, Ohio, geared to a gate shear.



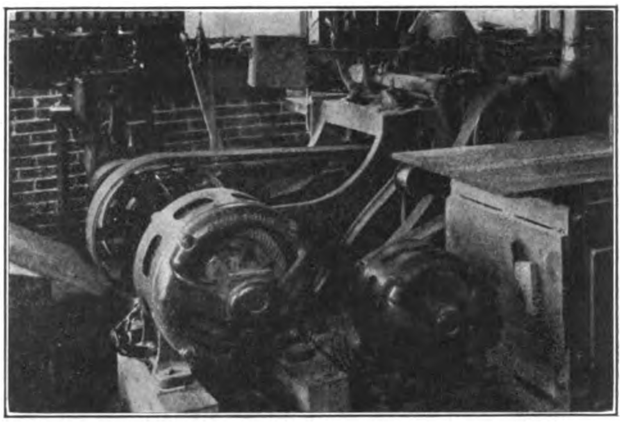
15 h.p., motor, made by The Lincoln Electric Co., Cleveland, Ohio, direct connected to a Sirocco blower.



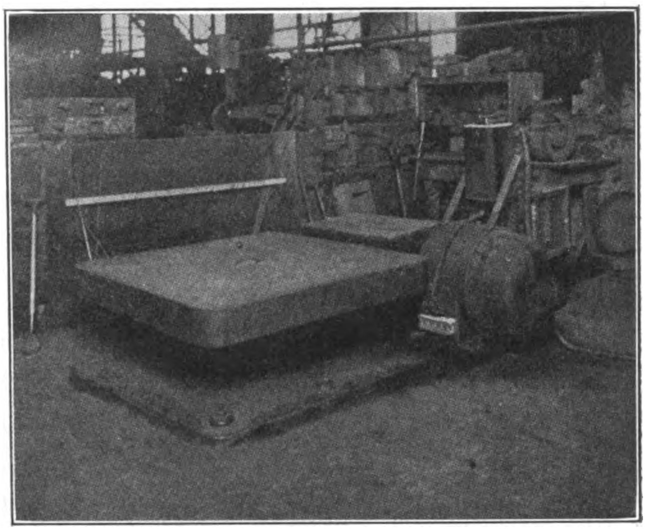
Curved blade shaver, driven by a direct current motor, made by American Rotary Valve Co., 156 North Dearborn street, Chicago.



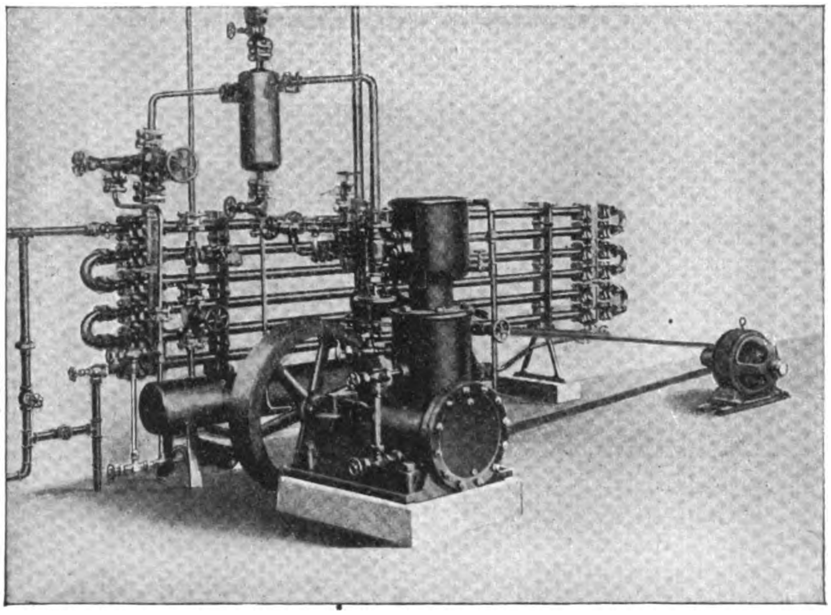
10 h.p., 1200-1560 r.p.m., Rothmotor direct current grinder, arranged for external ventilation. Roth Bros. & Co., Adams & Loomis streets, Chicago.



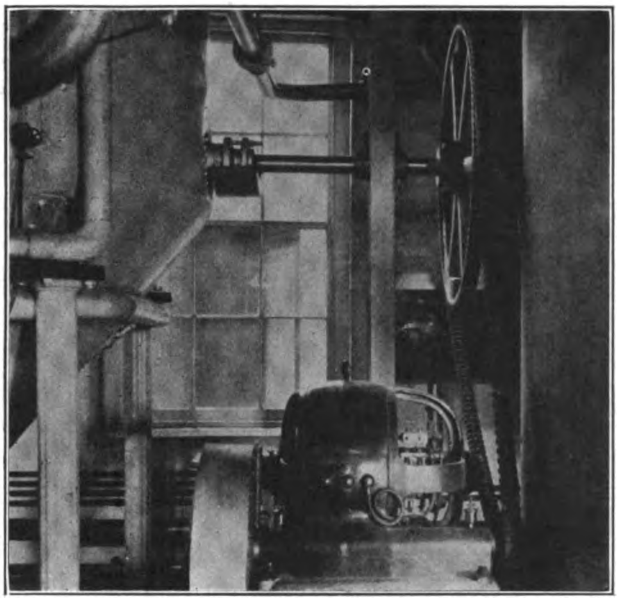
A 10 h.p., 1720 r.p.m., induction motor, belted to rip saw, and a 20 h.p., 850 r.p.m., induction motor, coupled to a ten inch molder; 3 phase, 60 cycle, 220 volt, alternating current; plant of Hart Planing Mill Co., Wilkinsburg, Pa. Crocker-Wheeler Co., Ampere, N. J.



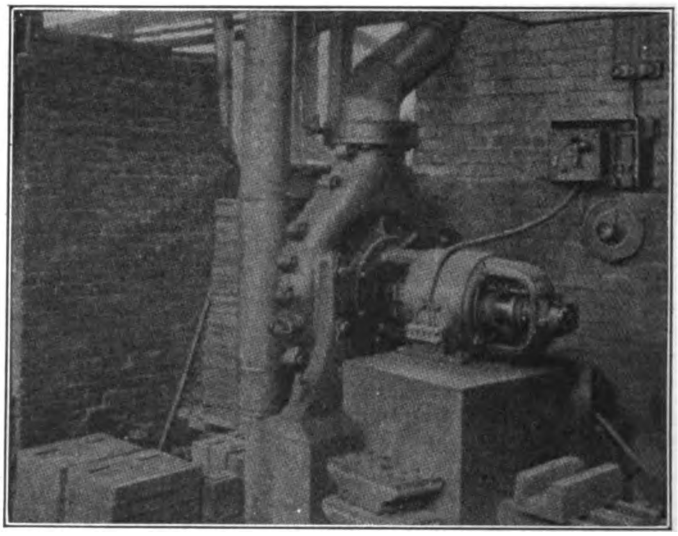
10 h.p., direct current motor, made by General Electric Co., Schenectady, N. Y., operating jolt ramming machine for molds weighing up to 9,000 pounds.



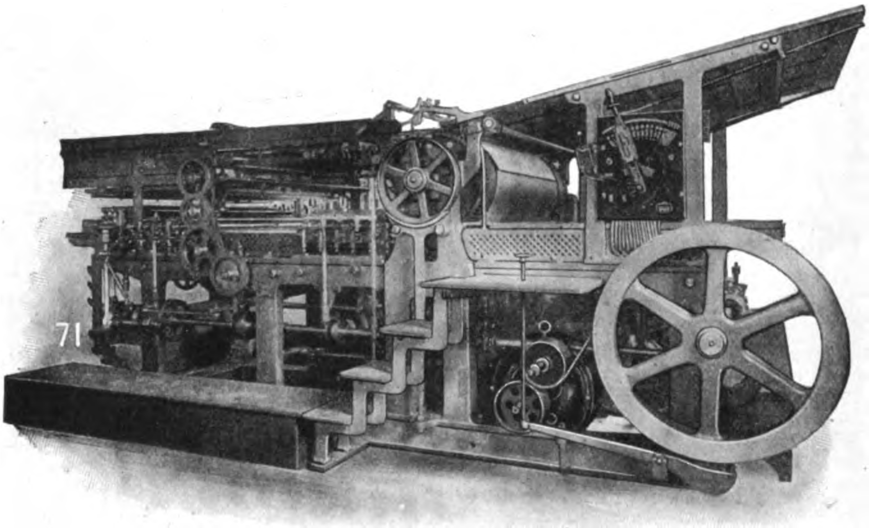
10 h.p., direct current motor, made by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., driving a 3-ton Vilter refrigerating machine.



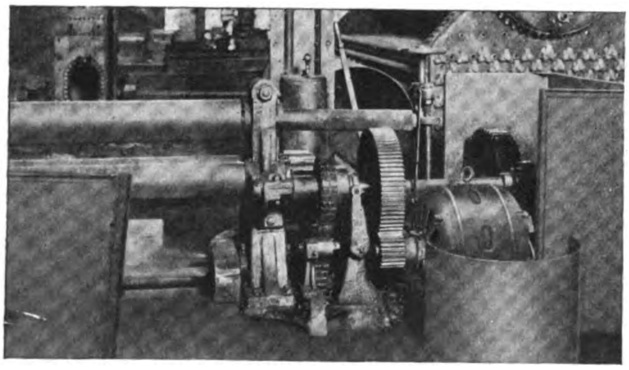
15 h.p., 115 volt, 800 r.p.m., geared shaft motor, made by Crocer-Wheeler Co., Ampere, N. J., driving agitator in rice cooker, Peter Doelger brewery, New York.



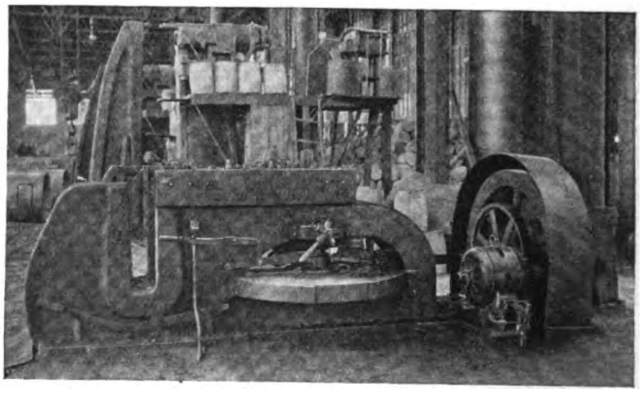
7½ h.p., direct current motor, made by General Electric Co., Schenectady, N. Y., driving centrifugal air compressor at 3450 r.p.m.



7½ h.p., 115 volt, 600 r.p.m., direct current motor, with idler pulley, made by The Robbins & Myers Co., Springfield, Ohio, operating an eight-stop Hoe press.



10 h.p., 1140 r.p.m., 3 phase, 60 cycle, 220 volt motor, made by Wagner Electric Mfg. Co., 6400 Plymouth avenue, St. Louis, Mo., geared to a bending roll in Heine Boiler Works.



7½ h.p., 3 phase, 60 cycle, 220 volt, squirrel cage motor, made by Wagner Electric Mfg. Co., 6400 Plymouth avenue, St. Louis, Mo., geared to a 1¼ inch soft steel vertical punch.

The July article will give the uses for motors of from 15 to 50 horse power. A number of devices capable of being operated by such motors will be illustrated.

CENTRAL STATION MISCELLANY

The jitney invasion of Grand Rapids, Mich., which started last February, is probably partly responsible for the decrease of nearly 10 per cent. in the gross earnings for March of the Grand Rapids Railway Company. Gross earnings were $93,284, a shrinkage of $10,271 compared with March, 1914. This is one of the few subsidiaries of the Commonwealth Power, Railway and Light Company to be subjected to jitney competition. The Grand Rapids Railway Company controls more than 950 miles of electric railway, but the greater part of this is high speed interurban lines upon which jitney competition can have little effect. Grand Rapids is taking steps toward the regulation of the jitneys.

The Commonwealth Edison Co., Chicago, is distributing a number of pieces of literature to consumers, consisting of mailing folders, booklets, and pamphlets, pointing out the advantages of central station service, and showing effective methods of using electricity for signs, store and window lighting, and factory illumination.

During the month of May, the United Electric Light and Power Co., New York, maintained a model electrical apartment in a new fireproof ten story apartment building on the corner of Broadway and 146th street. The apartment was loaned for the purpose by the owners of the building, and was completely equipped with electrical household devices, the various manufacturers of such devices loaning them for this demonstration of the labor saved by the use of electricity in household management. The apartment was completely furnished. The customers of the company were invited to atteud and afternoon tea was served.

One of the clauses of the proposed set of rules now being drawn up by the Bureau of Standards, a clause that will be of more than ordinary interest to central station managers, says that lamps furnished by utilities to customers without charge (free renewals) or at prices less than open market prices should be of such efficiency in watts per candle when used on the utilities circuits of standard voltage that the cost of light per candlepower hour to customers will not exceed the cost per candlepower hour, when incandescent lamps are bought in the open market.

Stockholders of the Detroit Edison Co. will hold a special meeting on June 8, to take action on a recommendation proposed by the board of directors calling for the execution and delivery to a trustee, to be selected by the board, of a mortgage on all of the property and franchises of the company, as security for the issue of twenty-five-year bonds to an aggregate amount not exceeding $75,000,000. The bonds are to be sold from time to time and on such terms and conditions as may be deemed advisable by the board of directors. This new financing, it is announced, is necessary to enable the company to meet the demands of its increasing business, as each year large expenditures for extensions and enlargements must be provided for in addition to the amount of cash devoted to this purpose out of surplus earnings.

O. H. Hutchings has been appointed associate general manager and engineer of the Dayton Power & Light Co., following the departure for New York of F. M. Tait, who will retain the title of president and general manager. Mr. Hutchings has for a number of years been general superintendent and engineer of the Dayton company.

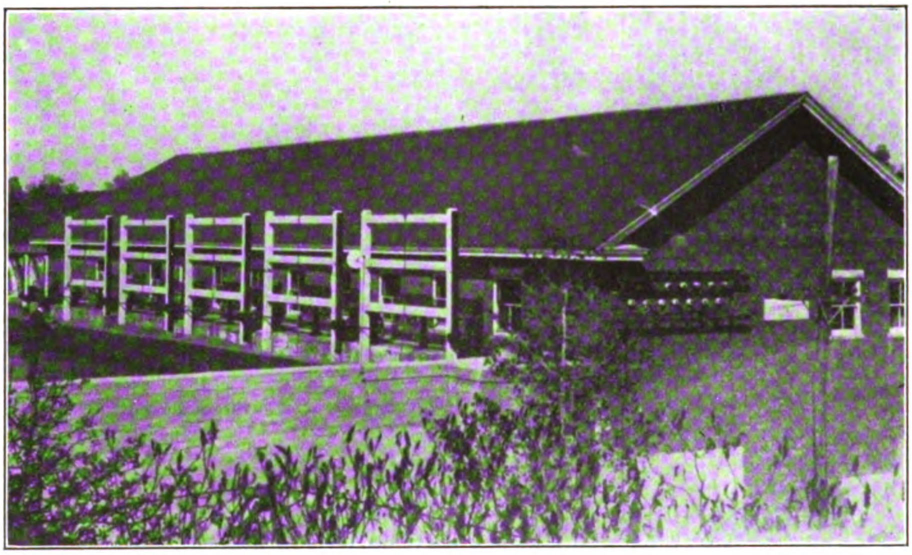
The Ohio Gas and Electric Company has applied to the Ohio Public Utilities Commission for authority to purchase the property of the Middletown Gas and Electric Company, the Franklin Electric Light Company, the Leetonia Electric Company, and the New Lisbon Gas Company. The Ohio Gas and Electric Company also asks for permission to issue and sell $700,000 thirty year 6 per cent. bonds at 85, $200,000 ten year 6 per cent. debentures at 80, and $795,000 common stock at 70 to provide funds for the purchase of the properties and to expend $42,500 on extensions and additions to the Middletown plant.

The New York Edison Co., during a fifteen-day period from May 15 to May 30, 1915, held in their showrooms at 124 West 42nd street and 130 East Fifteenth street, New York, an exhibition of electric table lamps, loaned by a number of designers and manufacturers. In addition to the lamps, some of the newer methods in semi-indirect and indirect illumination were shown. Among the companies represented were: Art Metal Works, Bayley and Sons, Handel Company, Macbeth Evans Glass Co., Edward Miller and Co., National X-Ray Reflector Co., Charles Parker Co., and Sibley and Pitman.

The Commonwealth Edison Co. of Chicago announces that hereafter all residence and apartment lighting installations which do not exceed 2640 watts or four circuits must have the service mains and meter loops wired two-wire, as such installations will be connected to the company s system by two service wires at 115 volts. The company will not hereafter connect such an installation three-wire, unless the connected load exceeds the above stated limits. Business-lighting installations will be connected as heretofore; that is, all installations of over 1320 watts must be wired for three-wire service and three-wire meter loops. If such an installation totals less than 1320 watts, it should be wired with two-wire service mains.

Hydroelectric Development in Maine

A large public service corporation of southern Maine, which operates an extensive plant supplying power and light, and also three electric railways, is the Androscoggin Electric Co., with headquarters at Lewiston. This company is the successor to the Lewiston & Auburn Electric Light Co. and the Portland-Lewiston Interurban Railroad, and it controls the Mechanic Falls Electric Light Co. and the Norway & Paris Street Railway Co. The above properties are held by interests centering in the Libbey & Dingley Co., textile manufacturers, of Lewiston.



Exterior of the Deer Rips station of the Androscoggin Electric Co.

An important water power was early utilized in connection with mills at this place. The Androscoggin company's present electric generating stations are as follows: the principal hydroelectric station at Deer Rips, about 3½ miles north of Lewiston, where a head of 32 ft. is utilized; a station at Littlefield, south of Lewiston, with a 21 ft. head; a small station at Barker Mill, southeast of the city, on the Little Androscoggin River, where a 32 ft. head is available; and a new steam turbine generating station in Lewiston, for auxiliary and standby service in case of extremely low water or other contingency.

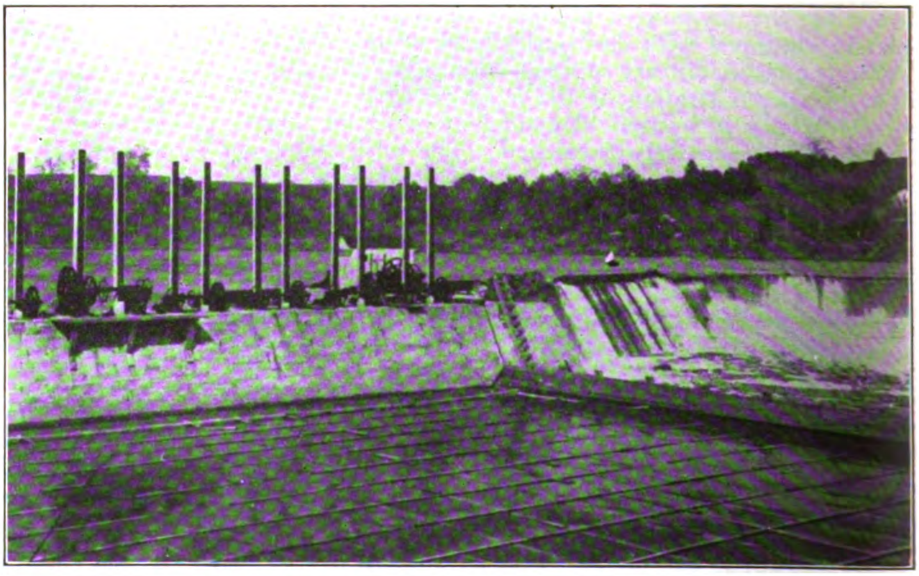
Three-phase, 60-cycle energy, at 10,000 volts, is generated at the three water-power stations, which are interconnected with a transformer and distributing station in Lewiston, there reduced to 2,300 volts for local distribution. The steam plant generates at 2,300 volts.

The dam at Deer Rips is of concrete construction, about 800 ft. long, 28 ft. thick at the base and 9 ft. thick at the top, and designed for 2 ft. flashboards. The pond is set back a distance of 8 miles.

The station is of brick with reinforced concrete foundations, the draft tubes being of steel, cast in the cement. The building is 150 ft. long by 45 ft. wide and contains a generating room, which occupies the full length of the structure and is 28 ft. wide. A gallery the length of the building and 17 ft. wide contains the switchboard and high-tension apparatus. Two iron stairways lead from the generating floor to the gallery, which is over the wheel cases.

Motor-operated sluice gates are located in the head works A canal 750 ft. long and about 75 ft. wide leads from the pond to a forebay which is as wide as the length of the building. Five 42 in. Holyoke Machine Co., type C twin wheels are located in an open flume. Directly connected on the same shafts are five 1,000-kw. General Electric revolving field generators operating with the wheels, at 180 r.p.m. In connection with each wheel is a Type A Lombard Improved governor, made by the Holyoke Machine Works. There are two exciters, each General Electric, of 100 kw. rating, direct connected to 24-in. Victor wheels, of Pratt Iron Works, Dayton, O., manufacture. One of the exciter turbines is controlled by a Lombard governor, and the other by one designed by the late W. Scott Libbey, of Lewiston.

The switchboard consists of 14 panels of blue marble, and carries a Tirrill regulator, a Westinghouse Type U graphic voltmeter, a Thomson polyphase meter on each of the 6 feeders, Thomson watt hour meter, and other usual control and measuring apparatus.

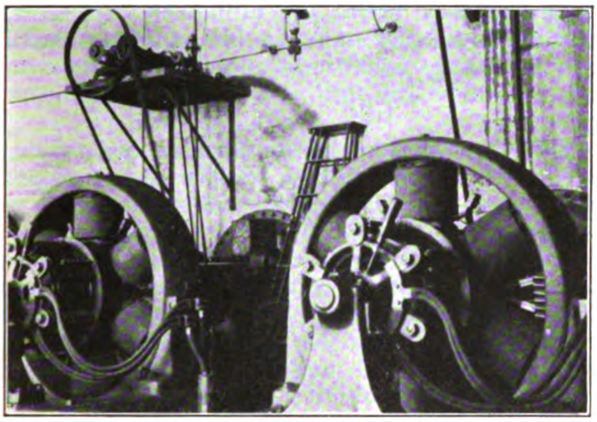


Headworks and intake gates. Deer Rips station of the Androscoggin Electric Co.

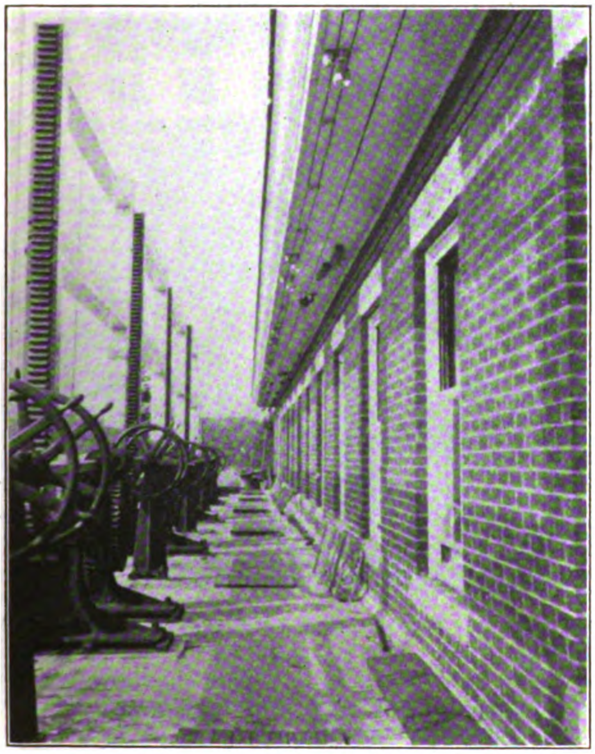
The switchboard is located on the gallery floor, in the center of the station, and is set close to the outer ledge of the concrete floor, a plank walk about 3½ ft.

wide, supported on brackets, being provided for the operators. From the back of the board the switch rods are carried along the floor under a board platform elevated 4 in. above the floor on sections of joist. A working space of about 4 ft. is provided between the board and the switch cells, which are of separate concrete compartments, in two banks.

A pipework structure over the switchboard gallery carries the outgoing lines to bushings in the southwest end of the station wall, where the porcelain bushings are carried through a panel in the wall, the inside half of the panel being of concrete and the outer of a single course of brick, this construction giving greater security than bushings run through the full thickness of the brick wall.



Exciters in the Deer Rips station of the Androscoggin Electric Co.

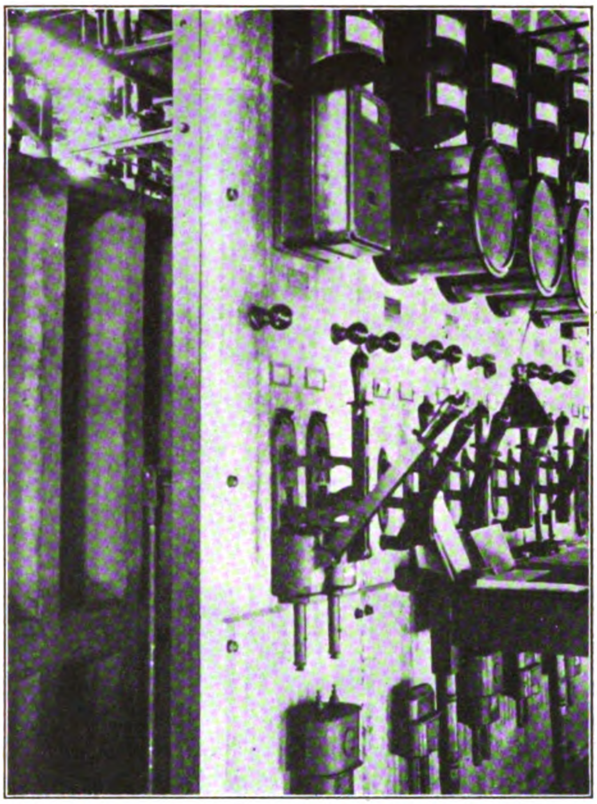


Headgates of the Deer Rips station of the Androscoggin Electric Co.

A hydraulic gauge on the generating room wall shows the water level in the canal on a large wooden indicator board by stages based on a bench mark in the river below the station.

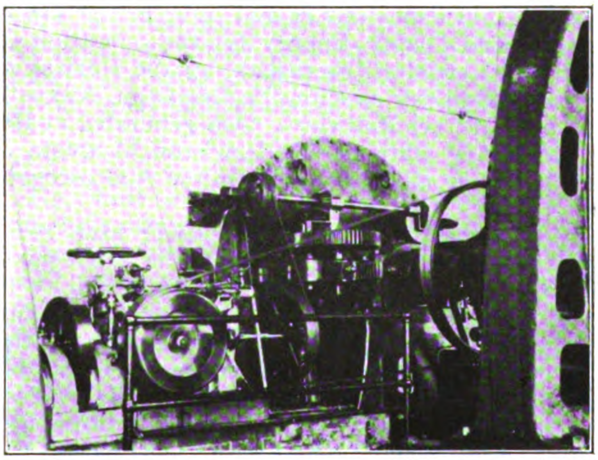
General Electric aluminum-cell lightning arresters are located at the southwest end of the oil switch structure, in an enclosure for protection, made of coarse-mesh netting stretched on a frame of pipework corner posts. A 15-ton hand operated crane of local manufacture operates over the generator floor, with a 28 ft. span.

The hydroelectric station at Littlefield has an installation of 3 Hercules wheels, direct connected on a single shaft with one 1,000-kw. General Electric revolving field generator producing three-phase energy at 10,000 volts. The Barker Mill generating station is equipped with twin wheels, direct connected with a 400-kw. General Electric generator, wound for 10,000 volts.



Portion of switchboard and switch cells in rear of the Deer Rips station of the Androscoggin Electric Co.

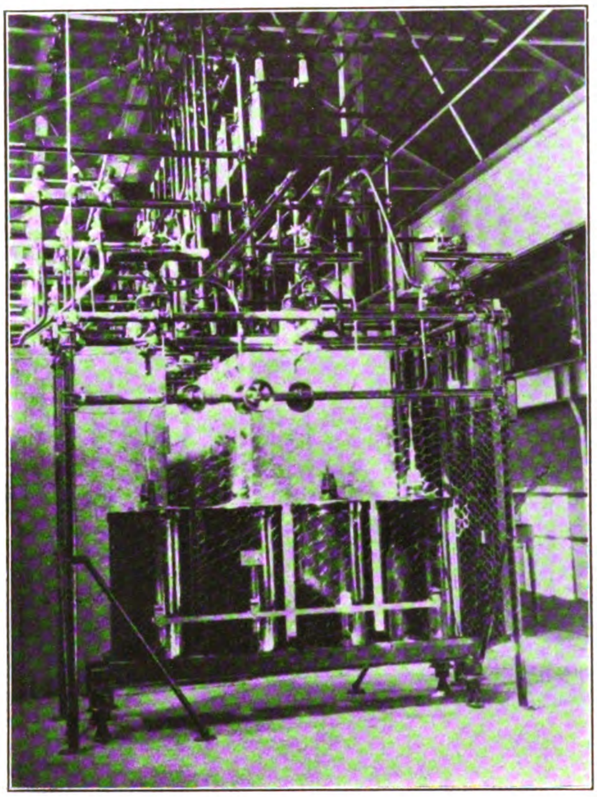
The steam station, recently completed, is a fine brick building 96 by 65 ft., divided about equally into two high rooms, one for the boilers and the other for the steam turbines. The boiler equipment consists of two Heine boilers, each rated 518 h.p., with normal steam pressure of 175 lb. The turbines are of the



Holyoke Machine Works governor on generator in the Deer Rips station of the Androscoggin Electric Co.

Curtiss pattern, one being of 1,000 kw. and the other of 500-kw. rated capacity, operating at 3,600 r.p.m. and delivering two-phase energy at 2,300 volts, and a 15-ton Whiting crane serves the turbine room.

Transformer equipment, now located in a substation connected with a textile mill, will soon be reinstalled in a brick transformer house, adjoining the steam plant, now in process of construction. This apparatus consists of four sets of 1,000-kw. General Electric air-blast cooled units operated under a ¾ oz. air pressure and rated 10,000 volts, three phase—2,200 volts, two phase.



Lightning arresters and oil switches in the Deer Rips station of the Androscoggin Electric Co.

The Androscoggin Electric Co. does a lighting and commercial business in the cities of Lewiston and Auburn, and through the Norway & Paris Street Railway Co. furnishes power and light in the towns of Norway and Paris. Energy for the operation of the Portland-Lewiston Interurban, for the Norway & Paris Street Railway and for the Lewiston, Augusta & Waterville Street Railway is also generated at the above-mentioned stations, the Lewiston, Augusta & Waterville buying all its power from the Androscoggin company.

The Androscoggin Electric Co.'s power load, aside from that used by the street railways, is about 3,000 kw. Large power users include a textile mill, with about 400 h.p. in motors, and a shoe factory having about 250 h.p. connected. In addition, most of the smaller industries of the section are motor-equipped. The Poland Springs hotel is served by the Androscoggin company, by means of a special transmission line. At the hotel and famous springs are about 100 h.p. in motors, which are employed for bottling, pumping, and box-board sawing.

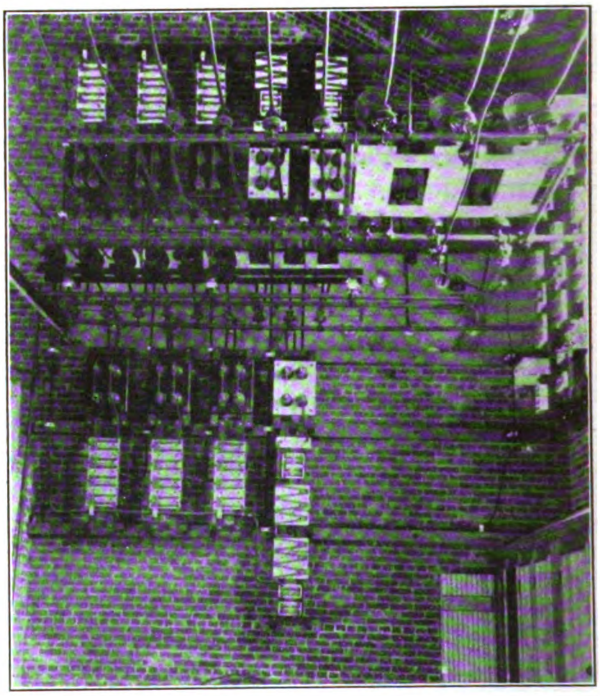
Lighting for the city of Auburn is furnished to the municipality's 6.6-amp. arc lamps on ornamental poles on the principal streets, and to a large number of 40-watt incandescents. The city of Lewiston has a municipal plant.

The Portland-Lewiston Interurban Railroad connects these two Maine cities and is 30 miles in length. It was opened to the public July 2, 1914, and has come to be an excellent business proposition. Cars are run hourly in either direction, making the trip between the center of Lewiston and Congress square, Portland, in 1 hr. 25 m. The cars enter the city of Portland over the rails of the Portland Railroad Co., a subsidiary of the Cumberland County Power & Light Co.

On the Interurban line, which was constructed by the Libbey-Dingley interests, are three substations—at Danville, Gray, and West Falmouth. At each of these villages a brick structure is a combination substation for rotary converters and transformer equipment, and the other half, a waiting room for passengers.

Each of the substations contains an installation of 300-kw. in General Electric rotary converters for railway work, operating from transformers at 360 volts alternating current and producing 550-volts direct current.

The Androscoggin Co.'s transmission lines are as follows: a double three-phase seven-strand aluminum line—equivalent to No. 1 copper—between Deer Rips generating station and the Lewiston distributing station, a distance of about 3½ miles; a double aluminum line between Deer Rips and the Lewiston, Augusta & Waterville Railway's substation, about 5 miles southeast, both these lines carrying 10,000 volts; a single 10,000-volt aluminum line between Barker Mill generating station and the Lewiston distributing station, about 1½ miles; a 10,000-volt No. 1, bare copper line from Deer Rips to Littlefield and Danville; and one of like capacity for railway service to Turner.



Outgoing lines in the Deer Rips station of the Androscoggin Electric Co.

The transmission lines in general consist of 40 ft. chestnut poles with a minimum diameter of 8 in. at the top and spaced at an average of 120 ft. At a 700-ft. river crossing over the Androscoggin at Deer Rips, double pole construction with insulators secured between double arms, is employed and the conductor is 4-0 aluminum cable. Thomas porcelain insulators are used on both systems.

TECHNICAL
SCIENTIFIC

— FINDINGS —

PHILOSOPHICAL
THEORETICAL

A French firm is making an excellent cement from a by-product in the process of making beet-sugar. The scum that forms when the beets are boiled, and which has heretofore been thrown away, consists largely of calcium carbonate and water, and from 70,000 tons of beets treated 4000 tons of calcium carbonate are obtained; to this 1100 tons of clay are added, the resulting product being 3162 tons of excellent cement. The partially-dried scum is mixed with finely-divided clay, amalgamated by beaters, and burned in a rotary kiln.

A mineral has been discovered at Fiadanana, Madagascar, externally resembling euxenite and containing twelve to forty per cent. U_3O_8. Its radio-activity, tested by an aluminum foil electroscope, is about double that of the pure oxide, thus suggesting an important source of radium.

In Dresden, Saxony, says the U. S. Consul at that place, the great electrical concerns have changed their articles of production; factories which before the war produced iron railings or sewing machines are now making shells; a typewriter factory is making bicycles; chemical works which before the war produced nothing but dyes are making pharmaceutical articles. The ability of industrial concerns to alter the nature of their output is necessarily restricted, and the change in production is also confined to articles of domestic consumption, which, in turn, is limited to the decreasing purchasing capacity of the people.

The American Telephone & Telegraph Co., and associated and connected companies, are now giving service to 100 million people by means of 9 million telephones and 21 million miles of wire.

The relative value of men to society, says F. G. Baum, chief engineer of the Pacific Gas & Electric Co., cannot be expressed as any function of their length, breadth and thickness, but their value is a function of the saneness and fertility of their imagination, of the confidence inspired by their honesty and ability, and of the results accomplished by their energy and enthusiasm. Similarly, the value of a utility to a community is not capable of full determination by measurement of physical dimensions of structures and the classification of materials, and the fixing of unit prices, and the use of an adding machine.

The modern submarine depends for surface propulsion on some form of internal combustion engine; the earlier boats had gasoline engines and the later, heavy oil engines. For submerged propulsion they depend on electric motors, run by a storage battery, and of course, the distance they can run on such batteries is limited. Submerged the radius usually varies from 25 to 75 miles, depending on the speed and type, but on the surface goes as high as 5,000 or more miles. A submarine can, of course, remain submerged at rest, if desired, so that the length of time she can stay under water is not necessarily governed by the submerged radius. These motors can be run as generators for charging the storage batteries when on the surface. The vessel to submerge closes the hatches, stops the engines, admits water into tanks in the interior of the boat, until the buoyancy is nearly destroyed, and then by starting the motors from the storage battery, and inclining the diving or horizontal rudders and hydroplanes, the boat can take the depth desired.

It has been found that the addition of vanadium to rail steels increases the elastic limit, the ductility, resistance to alternating stresses, hardness, and resistance to wear. Its use does not demand any alteration in the rolling-mill practice; in fact, the yield of rails from the ingots is likely to be increased owing to a decreased tendency towards cracking and tearing in the rolls. Compared with ordinary, plain carbon steels, vanadium steel shows a lessened tendency to segregate, resulting in a denser and more uniform product. The most suitable percentage composition for vanadium rail steels is as follows: Carbon, 0.45 to 0.60; Si, over 0.10; Mn, 1.00 to 1.25; P, not over 0.05; S, not over 0.05; V, an addition of 4 pounds per gross ton.

The *Carnegie*, the yacht employed to make a magnetic survey of the earth, has just reached Honolulu after having passed through the Panama Canal. From there the staff will make magnetic observations in the South Pacific Ocean. These include the magnetic declination, the horizontal dip, and the intensity of the magnetic field, together with studies of atmospheric electricity. The *Carnegie* is non-magnetic, being built of wood with locust spikes and copper sheathed below the water line. The auxiliary engine and all stoves are of copper; the 1,400 lb. anchor is bronze; all metal fixtures are of non-magnetic material; all brass lamps being used throughout.

The most modern types of dreadnaughts in the American navy now have a power plant consisting of four 300 kw. direct current, turbo-generating sets, using the generally adopted commercial voltage of 230. In this respect the American navy, as well as others, has gone through various stages of experimentation; 80 volts was first employed, and then for a number of years all vessels utilized 125 volts, it being apparently the concensus of opinion at the time that it would be inadvisable and dangerous to use a higher voltage on shipboard. This voltage of 125 is now being employed in the American navy on all of the smaller vessels, but the change to 230 volts has been made for all of the larger battleships and probably will follow for war vessels of all types.

Electrical Prosperity Week

BY H. W. ALEXANDER

The big "Electrical Prosperity Week" campaign is now well under way. The staff of the Society for Electrical Development, which is to handle the campaign in conjunction with leaders in the electrical industry, has been materially strengthened. Among the new additions are John T. Kelly, until recently eastern publicity manager of the International Panama-Pacific Exposition, and C. Ridderhof, formerly advertising manager Hotpoint Electric Heating Co.

The society has appropriated $50,000 for special campaign work in addition to its appropriation of over $100,000 for regular work. The manufacturers, central stations, jobbers, contractors, and dealers—the whole united electrical industry participating in this epoch-making sales campaign, will spend many times this sum. Everything points to the most successful trade campaign ever carried on.

Tentative plans for the campaign were submitted to the advisory committee as a whole at its meeting Wednesday, May 19. The men present represented electrical interests everywhere. The plans were passed upon and will be published in convenient book form and distributed about June 10. It is the aim of the society to get this book of plans into the hands of every man in the electrical industry who is interested in the movement. Fully 50,000 copies will be distributed.

The committee also discussed the art design for the week. Some of the most prominent poster artists in America have worked on this design. It is the object of the society to have an art creation made which shall be emblematic of the power, convenience, and economy of electricity and also embody the prosperity idea. It is expected that the selection will be made known at an early date.

The design is to be used on billboards, poster stamps, booklets—everywhere that it is possible to print or lithograph it. The cumulative effect of this poster advertising should make it the most startling picture campaign ever conceived.

The publicity and sales experts connected with the big movement have devised any number of new and novel ideas for giving publicity to the big campaign and for popularizing electricity. Special effort will be made to show the public what can be done with electricity in the home, the industries, and for illuminating purposes. All electrical interests are now working to this end, but this special concerted campaign of education will make the effort more forcible.

Splendid co-operation is promised by the leading electrical organizations. The Jovian Congress and Past Jupiters' Association have endorsed the movement. The Jovian Leagues have held Electrical Prosperity Week meetings in different cities, notably one at Toledo, Ohio, which was the biggest Jovian meeting ever held in that city. Messrs. J. M. Wakeman, general manager of the society, and H. W. Alexander, director of publicity, were the speakers. Two members of the Field Co-operation Section of the society are now travelling throughout the country addressing chambers of commerce, boards of trade, and electrical organizations on the plans for the week.

The National Electric Light Association through its executive committee has pledged support to the movement. Prominent places on the N. E. L. A. programme at the San Francisco Convention have been reserved for addresses and discussion of the plans for the big week.

The Electric Vehicle Association of America has pledged its support. The different E. V. A. sections will make special plans for the campaign. Sociability and endurance runs and electrical vehicle parades will be conducted.

The trade press of the electrical and other industries have taken up the campaign with special articles. Interest is being aroused not only in the electrical but in the other industries as well. The newspapers have been running special stories for several weeks but the great avalanche of news matter in all publications will not come until this autumn.

The Panama-Pacific International Exposition will make the last week at the World's Fair, November 29 to December 4, the dates for "Electrical Prosperity Week," a great electrical celebration. This will mark the close of the fair and the campaign week.

The campaign, coming as it does just at the opening of the Christmas sales campaign, will be a "shop early" movement which will enable the electrical dealers to get in ahead of other merchants in lining up the holiday business. The selection of the week of November 29 to December 4 should be particularly pleasing to them.

Plans for the week are not completed, but when the national advertising to be done in the magazines is made known, the men of the electrical industry will realize that, without question, Electrical Prosperity Week will be the greatest trade and sales movement in commercial history.

Westinghouse Annual Report

The annual report of the Westinghouse Electric & Mfg. Co., recently issued, says that gross earnings last year amounted to $33,671,485, compared with $43,733,646 for the previous year. This reduction of $10,062,161, the report adds, was due chiefly to unfavorable business conditions, and partly to the fact that from June 5 to July 13, 1914, the main works at East Pittsburgh, Pa., were practically closed by a strike.

Operating expenses consumed $31,109,073 of the year's gross, leaving net manufacturing profits of $2,562,411, to which was added $1,158,527 of other income, making a net income of $3,720,939, a decrease of $2,277,139. Deductions for fixed charges left a balance available for dividends amounting to $2,009,744, and after allowing for the payment of the 7 per cent. on the $3,998,700 preferred stock outstanding, there was a surplus of $1,729,835, equal to 4.4 per cent. on the $38,716,137 common stock, compared with 10.7 per cent. earned during the year ended March 31, 1914.

The value of unfilled orders on March 31 last was $8,951,410, as compared with $7,951,385 at the close of the previous year. The average number of employees were, respectively, 15,145 and 18,635.

The cargo handled through the Panama Canal during March (635,057 tons) was 98.7 per cent. of the through freight hauled over the Panama Railway during the 12 months ending June 30, 1914, and is about 40,000 tons more than the through freight handled by the railroad in the fiscal year 1913.

Common Materials

SUCH AS ARE USED IN MANUFACTURING AND INSTALLING SPECIAL DEVICES. ALL NEW PRODUCTS ARE SHOWN IN THE DEPARTMENT SO NAMED.

No. 36---Small Metal Stampings

A metal stamping is any piece of sheet metal that has been formed or shaped by pressure, or cut out by a blow, usually by means of a die, the die determining the form of the stamping. There are three broad classes of stampings. First, those used in connection with lighting fixtures, usually of brass, and generally stamped and spun. Second, those used for large pieces of machinery, known as large stampings. Third, a class known as small stampings, and used for a host of purposes. This article treats of these small stampings.

Small metal stampings are not made in any standard shapes or sizes. They are made in the form of washers, lugs, and caps, but there are no standard sizes or shapes to these. Stampings are generally made to order from sample or blue print, and are made from sheet metal, brass, and copper.

USES IN THE ELECTRICAL INDUSTRY

It would be difficult to chronicle all the uses for small metal stampings in the electrical industry. The following, however, is a representative list of the interesting uses for these stampings in the electrical trade. They are used as parts for the following devices:

Annunciators
Attachment plugs
Batteries
Chain insulators
Cutouts
Flashlights
Fuse blocks
Fuse plugs
Fuses
Instruments
Induction coils
Lightning arresters
Receptacles
Rosettes
Sad irons
Sockets
Switches
Telephone switchboards
Telephones
Testing sets

They are also largely used in making electrical automobile devices, including: coils, distributors, timers, and vibrators. Molders of insulation are also large users of small metal stampings, as they frequently have to insert metal stampings into the parts they mold.

The parts for which small metal stampings are used in making the following devices are:

USE FOR METAL STAMPINGS

Annunciators—For face plates, indicators, card holders, and mechanism.

Attachment plugs—For washers, and contact clips.

Batteries—For caps, and contacts.

Chain insulators—Clamp for connecting insulator to chain.

Cutouts—For contacts.

Flashlights—For dial rims, caps, and contacts; case is generally drawn.

Fuse blocks—For contact clips.

Fuse plugs—For caps, washers, and rings.

Fuses—For ferrules; blades are generally cut and trimmed.

Instruments—A large number of the parts of instruments are composed of metal stampings, but no names can be given to them.

Induction coils—Frequently, household and medical coils have a number of stamped metal parts.

Lightning arresters—Medium and low voltage arresters have a number of stamped metal parts in their make up.

Receptacles—For contact clips, contact bases, base plates, face plates, switch blades, and shutters.

Rosettes—For contacts.

Sad irons—There are a number of small metal stampings used in making sad irons.

Sockets—For outer shells (sometimes), screw shells, eyelets for chain, shell terminals, bell pieces for chain, cams, frames, chain hooks, commutators, and commutator bushings.

Switches—For post blocks, fingers for blocks, lugs, blades, blade tips, spring hinge washers, and face plates.

Telephone switchboards—There are over a hundred different pieces of stamped metal used in making switchboards.

Telephones—A number of metal stamped parts are used for telephones, including number holders.

Testing sets—While there are a number of stamped metal parts used in connection with testing sets of various kinds, no names can be given to them.

MANUFACTURERS OF METAL STAMPINGS

The following companies are prepared to furnish small metal stampings for the manufacturers of electrical devices and specialties:

Bridgeport Brass Co., Bridgeport, Conn.
Bridgeport Metal Goods Mfg. Co., Bridgeport, Conn.
Clark & Son, A. N., Plainville, Conn.
Dewes Co., A., New York.
Empire Switch Co., Plainville, Conn.
Grammes & Sons, L. F., Allentown, Pa.
Hollander Bros., Bridgeport, Conn.
Massachusetts Machine Shop, Worcester, Mass.
Metal Specialty Mfg. Co., Waterbury, Conn.
Oakville Co., Waterbury, Conn.
Osborn & Stephenson Mfg. Co., Plainville, Conn.
Scoville Mfg. Co., Waterbury, Conn.
Stimpson Co., Edwin B., Brooklyn.
Waterbury Mfg. Co., Waterbury, Conn.
Waterbury Metal Products Co., Waterbury, Conn.

It is generally required that a sample of the part desired be sent, or a blue print or drawing submitted.

SPECIAL DEVICES

SHOWING ALL TYPES WITHOUT REGARD TO TIME THEY HAVE BEEN ON THE MARKET. ALL NEW PRODUCTS ARE SHOWN IN DEPARTMENT SO NAMED.

No. 30---Electrical Measuring Instruments—(*Continued*)

This article, the preceding one (published in the May issue of the ELECTRICAL RECORD), and subsequent articles on electrical measuring instruments, are not for the purpose of telling how to use instruments. They do not make any comparisons between the different kinds and makes of instruments, or go into details regarding the principles upon which the different kinds operate; nor do they in any way treat of the theory and design of instruments. These articles give the kind of information that is supposed to be common knowledge. This sort of information is acquired by actual experience and is not to be obtained from books. These articles are not compiled from catalogues and advertisements. The way in which this information was collected was by personal visits to and correspondence with those who know how to classify instruments and give them their proper names, and who have accurate knowledge of trade requirements.

In these articles electrical measuring instruments are defined, grouped in classes (a list of names being given to the kinds under each class), and separate definitions given for the kinds in each class. The various kinds of instruments are illustrated, the name, maker, and purpose of each instrument shown being given under the illustration.

INDICATING ELECTRICAL INSTRUMENTS

In the previous article, definitions of the kinds of recording and integrating electrical instruments were given. Definitions of the kinds of indicating electrical instruments (exclusive of testing) follow:

Ammeter—A device that measures and indicates the rate of current flow directly in amperes. Also called a current indicator. There are many types of ammeters. The illustrations show a number of them.

Automatic liquid indicator—A device that indicates the amount (in gallons) of liquids in tanks or other containers.

Cent-hour meter—A device for indicating the number of cents per hour that it costs to operate a current consuming device. Especially useful in demonstrating the cost of current for a device that operates on more than one heat.

Current indicator—See ammeter. A name sometimes given to an ammeter.

Differential voltmeter—A device for use in balancing the voltage of two sides of a three-wire system; also used when connecting generators in parallel. Differential voltmeters are usually made with the zero in the centre of the scale, and generally have scale values corresponding to the voltage of the line on which used.

Double reading meter—Sometimes considered as being a volt-ammeter. In reality it is a double reading volt-ammeter; that is, the instrument can be set to indicate on say, 150 volt and 30 ampere circuits, or on 15 volt and 3 ampere circuits. There are also three and four reading instruments.

Duplex meter—A duplex meter is a voltmeter and an ammeter in one—as one device—both volts and amperes being indicated.

Electrostatic ground detector—An instrument possessing the requisite insulation for high voltages and free from the influence of external static fields. Used to indicate the presence of any ground that occurs on high voltage systems. Operates in the same way as an electrostatic voltmeter.

Electrostatic voltmeter—An instrument possessing the requisite insulation for high voltages and free from the influence of external static fields, for measuring and indicating pressures on high voltage systems. As the total difference of potential is divided up among a number of condensers in series, the instrument is often referred to as a differential electrostatic voltmeter.

Energy meter—See wattmeter. A name sometimes given to a wattmeter.

Erg meter—An instrument that instead of indicating in watts, indicates in ergs.

Excess indicator—A device for indicating when a lighting circuit is overloaded, by causing the lamps on the circuit to flicker. One type is also provided with a dimming resistance to reduce the current supply below the adjusted load when attempt is made to use a current consuming device that draws more amperes than the circuit could ordinarily stand.

Frequency meter—An instrument for showing the variation in frequency of an alternating current.

Ground detector—A device for indicating instantly the presence of any ground that occurs on a system.

Hot wire instrument—An ammeter or voltmeter the readings of which are established by taking as a basis the expansion of a wire, obtained by an increase of temperature resulting from the passage through it of the circuit to be measured.

Illuminometer—An instrument, generally portable or semi-portable, for measuring illumination and brightness. It is related to a photometer but differs in that its scale is calibrated to read in foot candles.

Milli-ammeter — An ammeter with a scale having 1/1000 of an ampere divisions and giving readings in 1/1000 of an ampere, or a milli-ampere.

Milli-voltmeter—A voltmeter with a scale having 1/1000 of a volt divisions and giving readings in 1/1000 of a volt, or a milli-volt.

Phase indicator—An instrument for indicating when the pressure of an alternator is in phase with that of the circuit with which it is to be connected. Also called a synchronizer.

Phase rotation indicator—An instrument for indicating the phase rotation of polyphase circuits. Its use prevents the incorrect installing of motors, meters, and transformers, and also eliminates errors in connections.

Polarity indicator—A device employed to indicate the polarity of a magnet or the direction of a current.

Potential indicator—See voltmeter.

Power factor meter—A device for indicating the cosine of the angle of lag or lead and the power component of the volt-amperes at any moment. Also indicates reversal of power.

Pressure indicator—See voltmeter. Indicates the electric pressure in a circuit.

Reactive factor meter—A device for indicating the sine of the angle of lag or lead, which is always greater than the difference between unity and power factor, and therefore shows the idle component of the volt-amperes.

Speed indicator—A device for indicating the speed of machines, and which may be calibrated to indicate the number of revolutions per minute, cycles per second, percentage fast or slow, and so on. Also called tachometer.

Synchronizer—A device for indicating the exact difference in phase angle at every instant and the difference in frequency between an incoming machine and the system to which it is to be connected; gives exact indications and is a necessity in paralleling large generators. Also called phase indicator, and often referred to as a synchroscope.

Synchroscope—See synchronizer.

Tachometer—A device for measuring the velocity and variations of velocity of machines and shafts, and indicating on a dial the number of these revolutions per minute. Another type, called a magneto electric tachometer, consists of a small magneto generator in connection with a specially constructed portable voltmeter. See also, speed indicator.

Voltmeter—A device serving to measure and indicate the pressure (voltage) of an electric circuit. Sometimes called a pressure, or potential indicator.

Volt-ammeter — A name given to an instrument capable of measuring and indicating either or both volts and amperes in a circuit.

Voltameter—An instrument for measuring the strength of an electric current by the amount of electrolyte decomposed by it in a unit of time.

Wattless component meter—Essentially a wattmeter. It differs from a wattmeter, however, in that it measures the non-power producing component in a circuit.

Wattmeter—A device for indicating the power in an electric circuit. Sometimes called an energy meter.

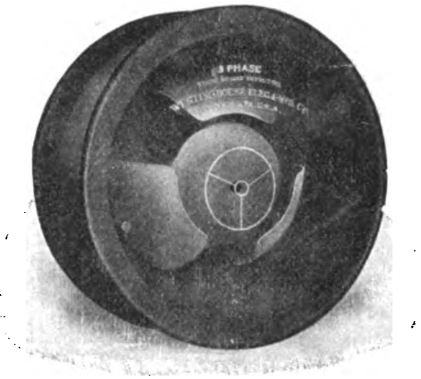
Zero centre meter—An ammeter or a voltmeter with the zero of the scale in the centre. In the case of the ammeter one end of the scale shows the rate of charge, the other the rate of discharge. In the case of the voltmeter the scale serves to indicate in which direction the current is flowing through a circuit.

ILLUSTRATIONS

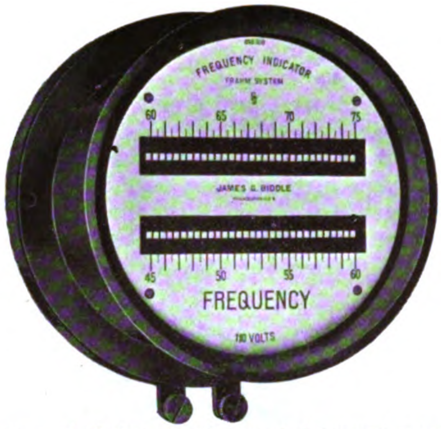
Various types of the different kinds of indicating instruments are illustrated in this article. The illustrations will be continued in the article to be published in the July issue. It will be noticed that the illustrations include the straight indicating instruments, and the testing (indicating) instruments. The illustrations in this and the July issue complete the indicating (including testing) instruments. Definitions of the testing instruments will be given in the July article.

Three-phase, electrostatic ground detector; capacities, 1150 to 3300 volts. General Electric Co., Schenectady, N. Y.

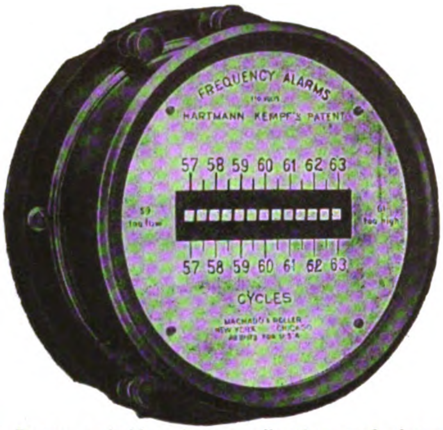
Illuminometer, semi-portable type, for the measurement of illumination and brightness. It differs from the ordinary photometer in details of construction only, and its scale is calibrated to read in foot-candles. The Leeds & Northrup Co., 4901 Stenton avenue, Philadelphia, Pa.



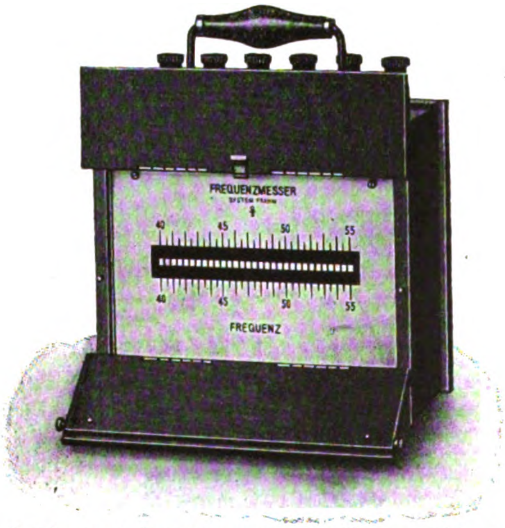
Polyphase, electrostatic, ground detector for high voltage circuits: indicates a ground in any phase and shows which phase is grounded. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



Switchboard type of Frahm vibrating reed frequency meter, with two rows of reeds for wide range. James G. Biddle, 1211-1213 Arch street, Philadelphia, Pa.

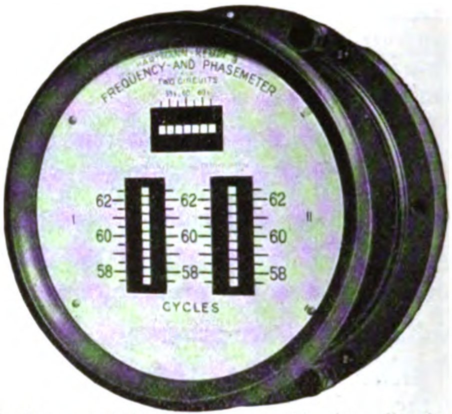


Hartmann & Braun, switchboard type, vibrating reed, frequency meter, for 110 volts. Roller-Smith Co., 203 Broadway, New York.

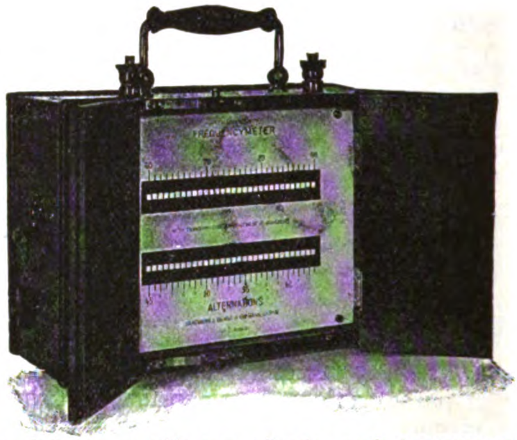


Frahm, vibrating reed, frequency meter, portable type, with one row of reeds. James G. Biddle, 1211-1213 Arch street, Philadelphia, Pa.

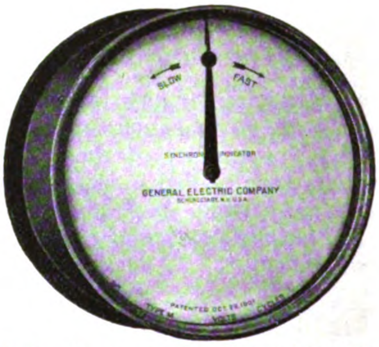
Synchroscope, for 100 to 125 volts, 25 to 60 cycles; furnished with auxiliary box containing lamp transformer, condenser, and resistor, Weston Electrical Instrument Co., Waverley Park, Newark, N. J.



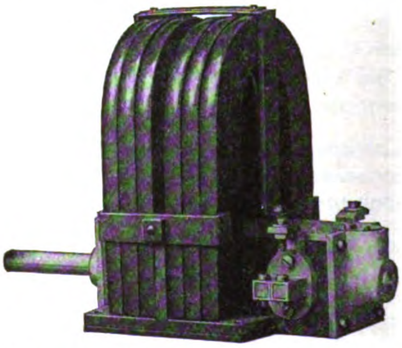
Hartmann & Braun switchboard type, combination vibrating reed, frequency meter and synchronoscope, or frequency- and phase-meter; for 25 and 60 cycle circuits. Roller-Smith Co., 203 Broadway, New York.



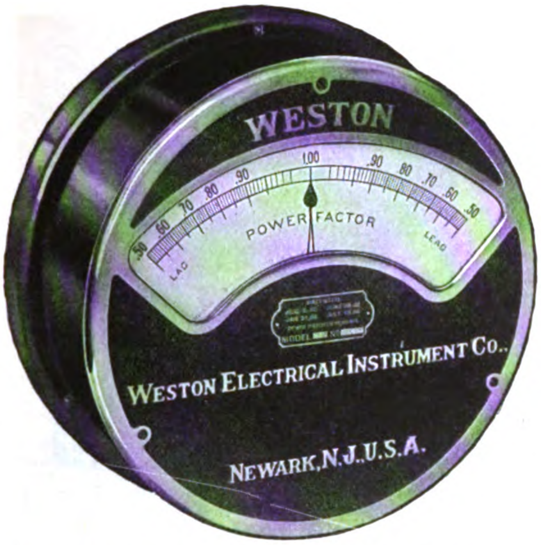
Hartmann & Braun, portable type, vibrating reed, frequency meter; for all potentials from 50 to 230 volts. Roller-Smith Co., 203 Broadway, New York.



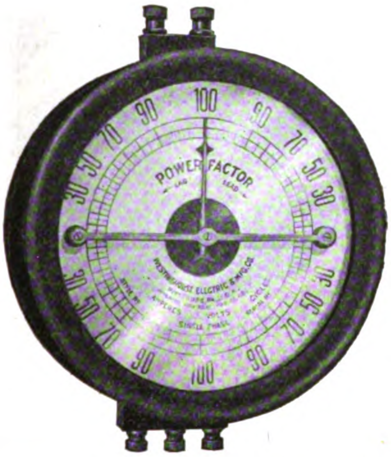
Synchronism indicator, for showing whether an incoming machine is running too fast or too slow; also accurately indicates the moment of synchronism and coincidence in phase of the running and starting machines. General Electric Co., Schenectady, N. Y.



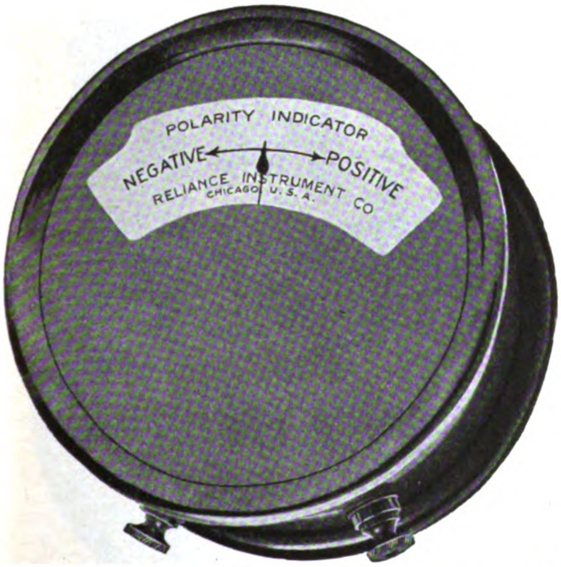
Magneto for electrical speed indicator; complete indicator consists of a magneto generator and a direct current measuring instrument; generally used to indicate r.p.m., of machines, although ft. per min., cycles per second and percentage fast or slow can also be indicated. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



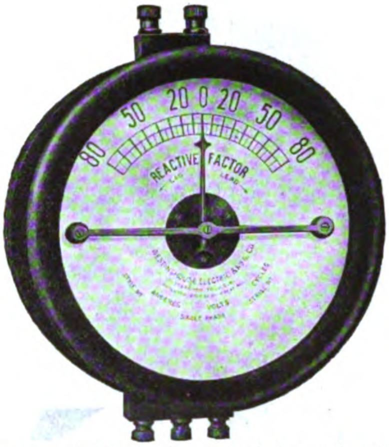
Single phase power factor meter; ratings, 100 to 750 volts, 5 to 100 amperes; scale, 50-1-50; for all frequencies. Weston Electrical Instrument Co., Waverley Park, Newark, N. J.



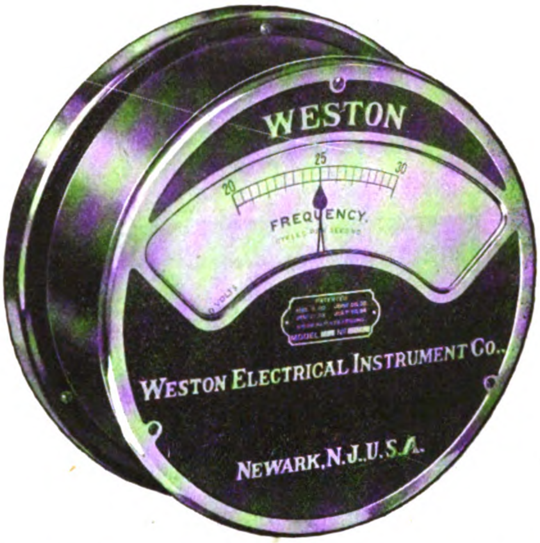
Power factor meter; indicates the cosine of the angle of lag or lead and shows the power component of the volt-amperes at any moment; also indicates reversal of power. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



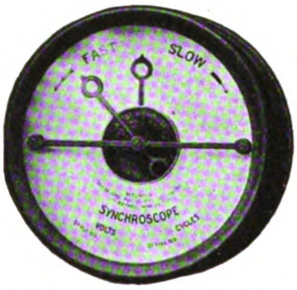
Polarity indicator, D'Arsonval type; ranges, 0-30, to 0-300 volts; for indicating the direction of flow of a current. Reliance Instrument Co., 1135 West Van Buren street, Chicago.



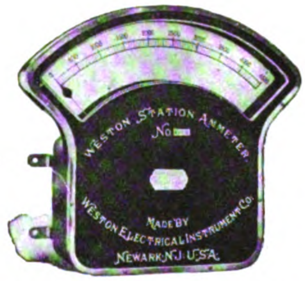
Reactive factor meter; indicates the sine of the angle of lag or lead, in every case greater than the difference between unity and power factor, and therefore shows the idle component of the volt-amperes. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



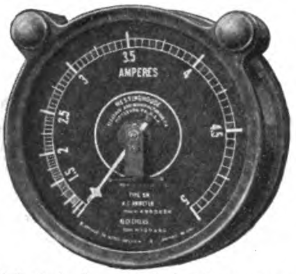
Switchboard type frequency meter, for from 100 to 125 volts, 20 to 133 cycles. Weston Electrical Instrument Co., Waverley Park, Newark, N. J.



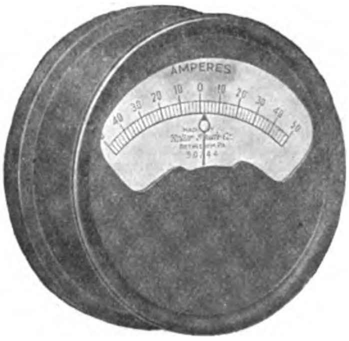
Synchroscope, or synchronizer; indicates the exact difference in phase angle and frequency between an incoming machine and the system to which it is to be connected. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



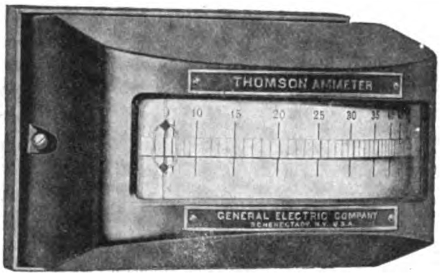
Illuminated dial, direct current switchboard ammeter; ranges from 200 to 10,000 amperes. Weston Electrical Instrument Co., Waverley Park, Newark, N. J.



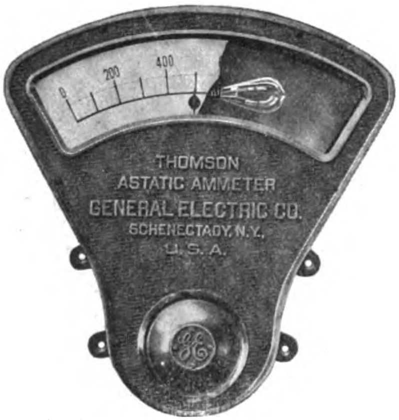
Illuminated, round dial, 7 inch, switchboard ammeter; dial is black with white markings. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



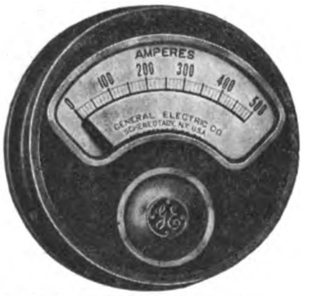
Switchboard type, direct current, zero centre ammeter. Roller-Smith Co., 203 Broadway, New York.



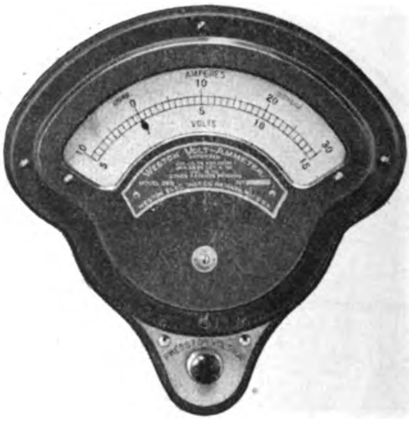
Horizontal, edgewise, switchboard, alternating current ammeter; capacities, 5 to 300 amperes, 175 to 750 volts. General Electric Co., Schenectady, N. Y.



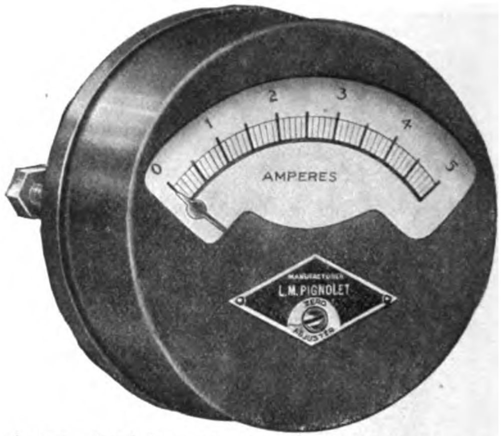
Switchboard type, illuminated dial, astatic ammeter; capacities from 100 to 750 volts. General Electric Co., Schenectady, N. Y.



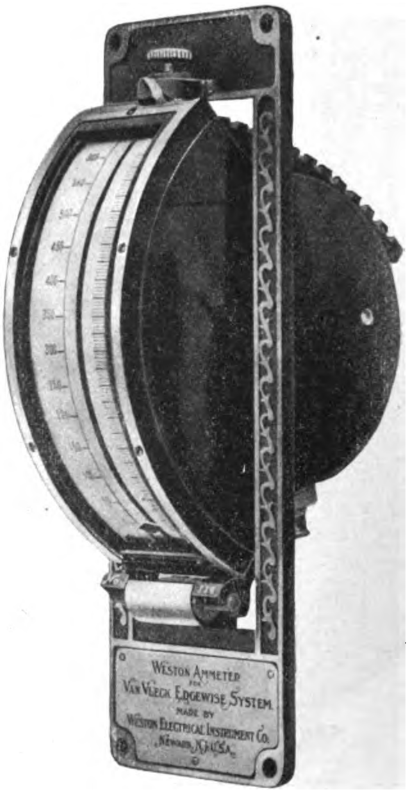
Round type, direct current, switchboard ammeter; capacities from 5 to 3,000 amperes. General Electric Co., Schenectady, N. Y.



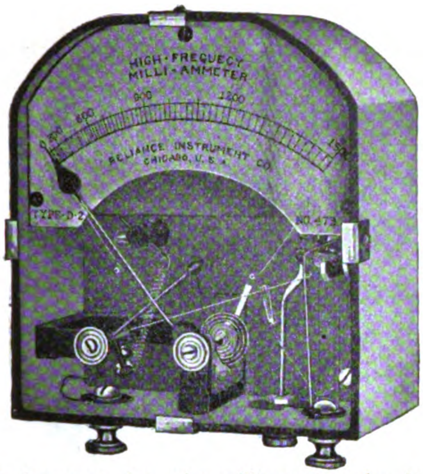
Switchboard, direct current, volt-ammeter; ordinarily measures current, but voltage may be obtained by pressing button; current and voltage cannot be measured simultaneously; ranges, from 1-0-3 to 20-0-30 amperes, and from 1-5-0-3 to 10-0-20 volts. Weston Electrical Instrument Co., Waverley Park, Newark, N. J.



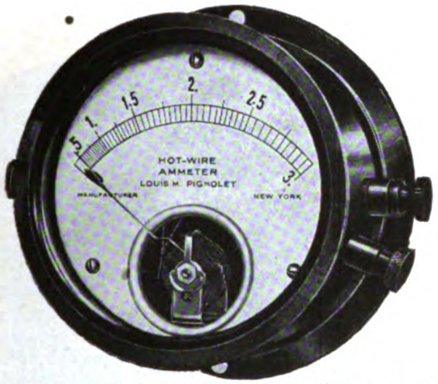
Switchboard type, closed face, ammeter for direct current; ranges from 0-1 to 0-50 amperes. Louis M. Pignolet, 78 Cortlandt street, New York.



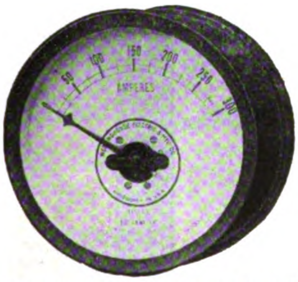
Edgewise type, direct current ammeter; ranges, from 200 to 2,500 amperes; value of each scale division, from 2 to 20 amperes. Weston Electrical Instrument Co., Waverley Park, Newark, N. J.



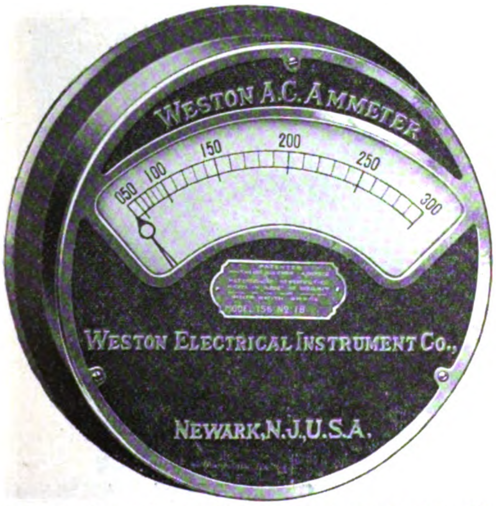
Visible, high frequency, hot wire milli-ammeter, for instructors' and students' use. Reliance Instrument Co., 1135 West Van Buren street, Chicago.



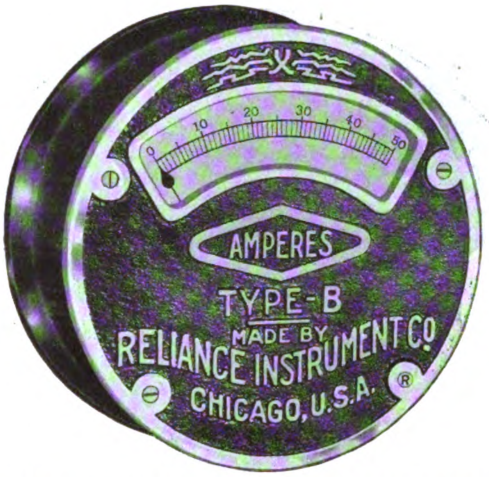
Hot wire ammeter, particularly adapted for wireless work. Louis M. Pignolet, 78 Cortlandt street, New York.



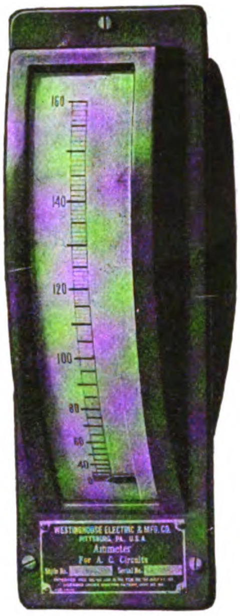
High voltage, direct current, switchboard ammeter; furnished for service up to 4,000 volts. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



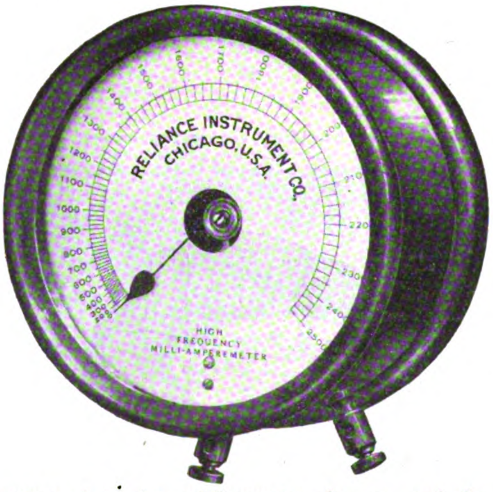
Switchboard type, alternating current ammeter; ranges, 1 to 500 amperes. Weston Electrical Instrument Co., Waverley, Park, Newark, N. J.



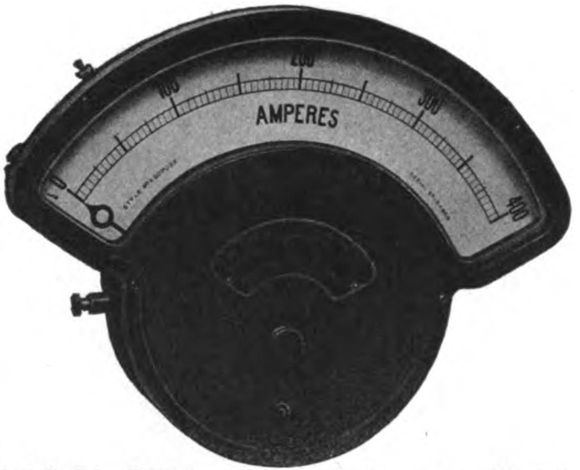
Switchboard, direct current ammeter; ranges from 0-75 to 0-300 amperes. Reliance Instrument Co., 1135 West Van Buren street, Chicago.



Vertical edgewise alternating current, switchboard ammeter, for use where the number of generators and feeders make necessary a compact arrangement of measuring apparatus. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

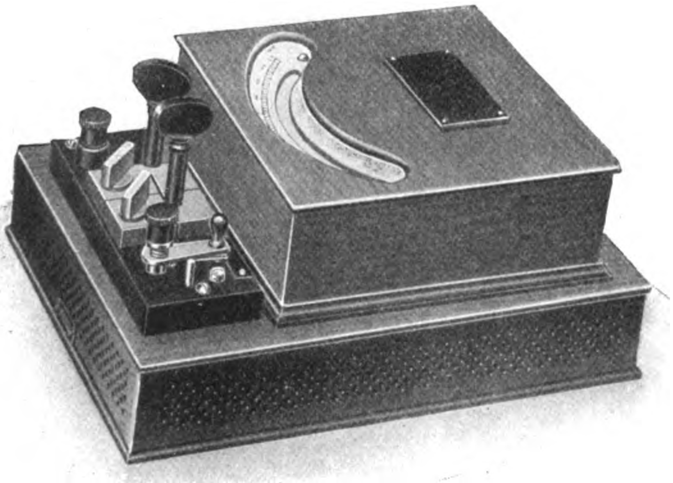


High frequency, hot wire, milli-ammeter, for a.c. and d.c. circuits; ranges, 0-2500, to 0-5,000 milli-amperes; for measuring currents used in auto condensation, diathermic or thermofaradic current; also for alternating currents of unusual wave shape or very high frequency. Reliance Instrument Co., 1135 West Van Buren street, Chicago.



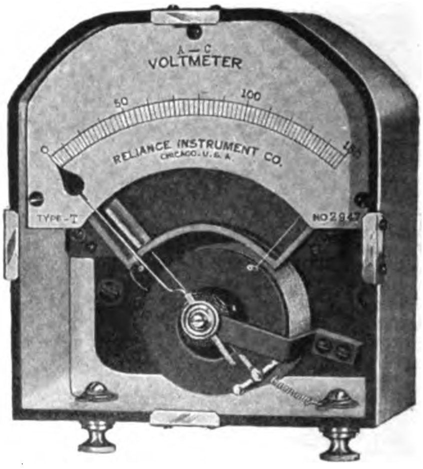
Illuminated dial, direct current, switchboard ammeter. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Switchboard type, round, alternating current ammeter; electromagnet movement; ranges 1 to 5 amperes, to 100 to 500 amperes. Roller-Smith Co., 203 Broadway, New York.

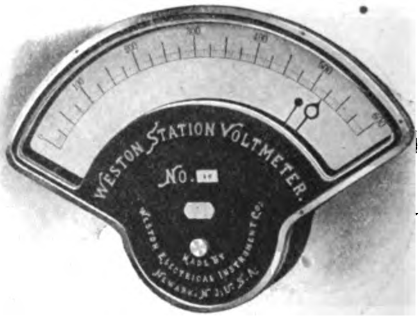


Siemens, laboratory type, precision, electrodynamometer wattmeter, for direct and alternating current; two current and two pressure ranges and 1000-ohm terminal. James G. Biddle, 1211-1213 Arch street, Philadelphia, Pa.

Switchboard type, round, direct current voltmeter; range 15 to 750 volts. Roller-Smith Co., 203 Broadway, New York.

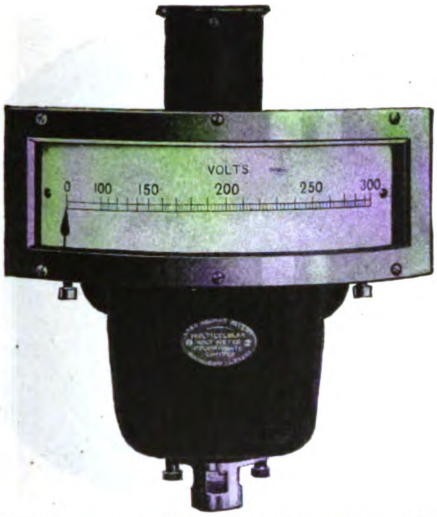


Visible, alternating current voltmeter for instructors' and students' use. Reliance Instrument Co., 1135 West Van Buren street, Chicago.

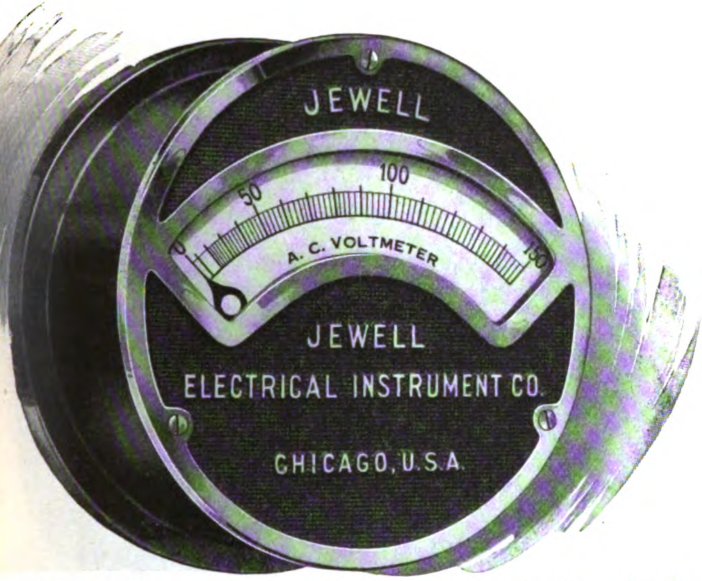

WESTON STATION VOLTMETER
NO.
MADE BY WESTON ELECTRICAL INSTRUMENT CO. NEWARK, N.J. U.S.A.

Extra large illuminated dial, direct current switchboard voltmeter; ranges, from 0-125 to 0-750 volts. Weston Electrical Instrument Co., Waverley Park, Newark, N. J.

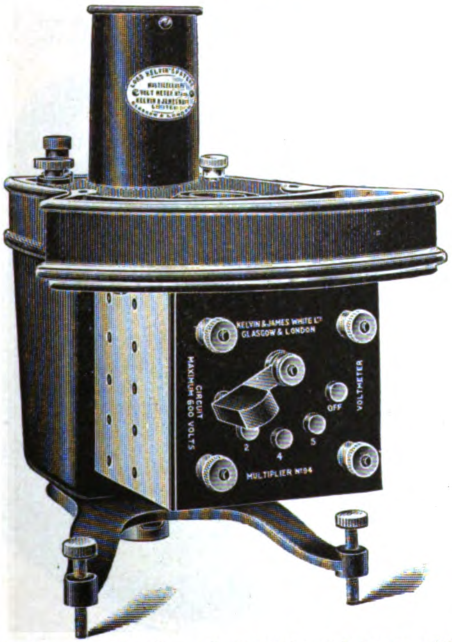
Electrostatic voltmeter (a.c. or d.c.) for voltages up to 200,000 volts, any frequency; current carrying parts immersed in oil. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



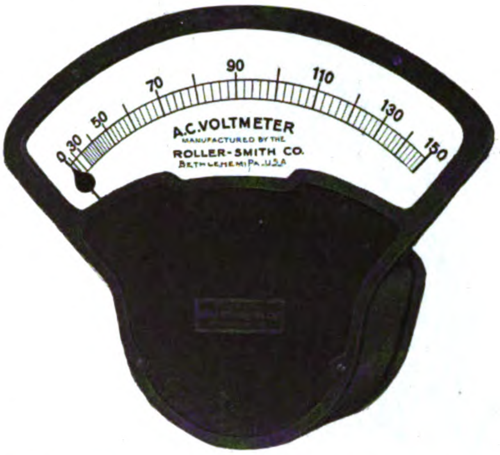
Kelvin, switchboard type, multicellular, electrostatic voltmeter; unaffected by temperature, external fields, wave form, power factor, or frequency. James G. Biddle, 1211-1213 Arch street, Philadelphia, Pa.



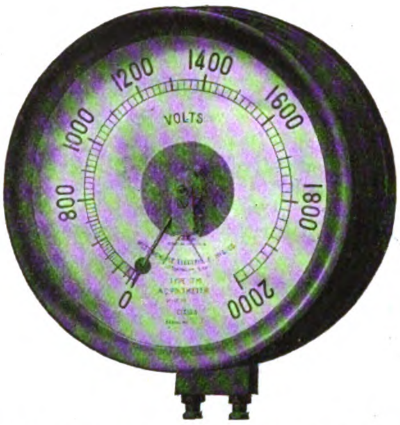
Switchboard type alternating current voltmeter; scale 0-150 volts, in 2 volt divisions; also available in other scales and for direct current. Jewell Electrical Instrument Co., 810 West Lake street, Chicago.



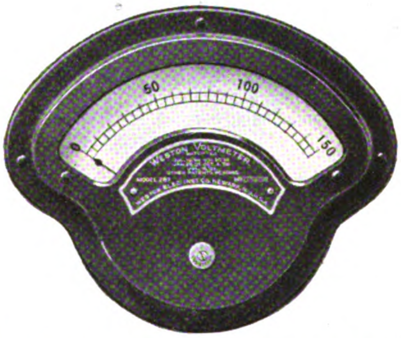
Kelvin, portable, multicellular, electrostatic voltmeter with multiplier attached. James G. Biddle, 1211-1213 Arch street, Philadelphia, Pa.



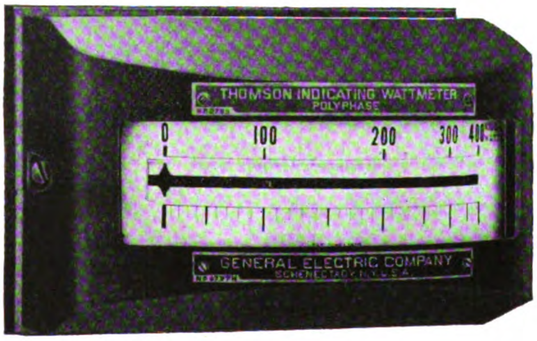
Illuminated dial, switchboard type, alternating current voltmeter; ranges, from 30 to 600 volts. Roller-Smith Co., 203 Broadway, New York.



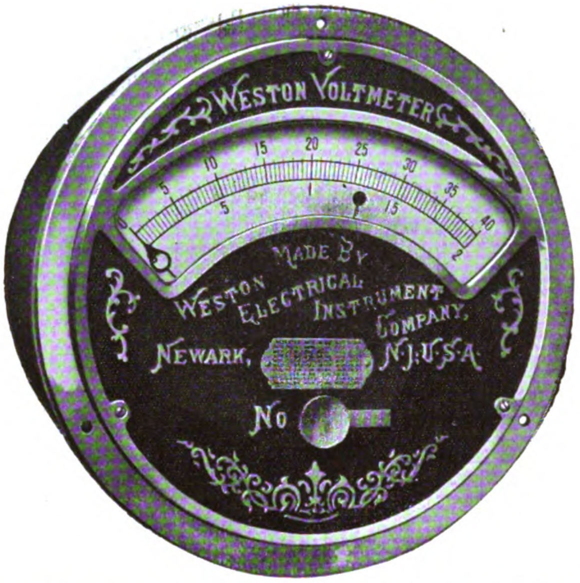
Round dial, 9 inch, alternating current, switchboard voltmeter, induction type. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



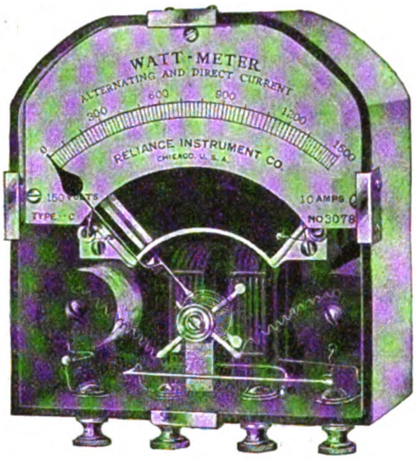
Miniature, direct current, switchboard voltmeter; one to 150 volts. Weston Electrical Instrument Co., Waverley Park, Newark, N. J.



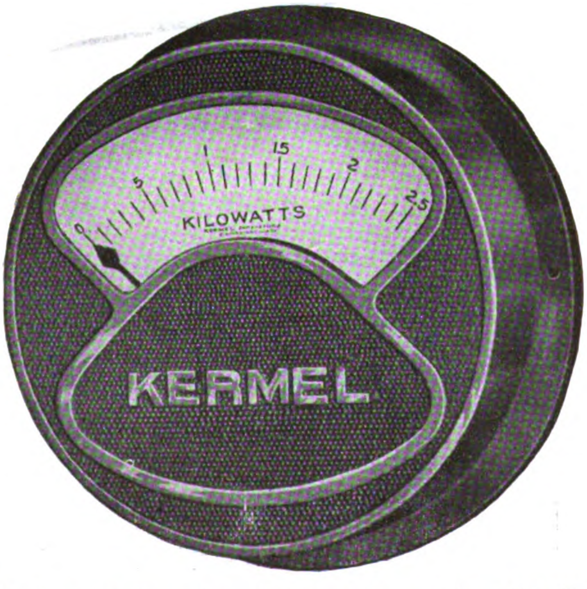
Horizontal edgewise, single phase, switchboard wattmeter; capacities, 5 to 200 amperes, 110 to 600 volts, 5 to 100 kilowatts. General Electric Co., Schenectady, N. Y.



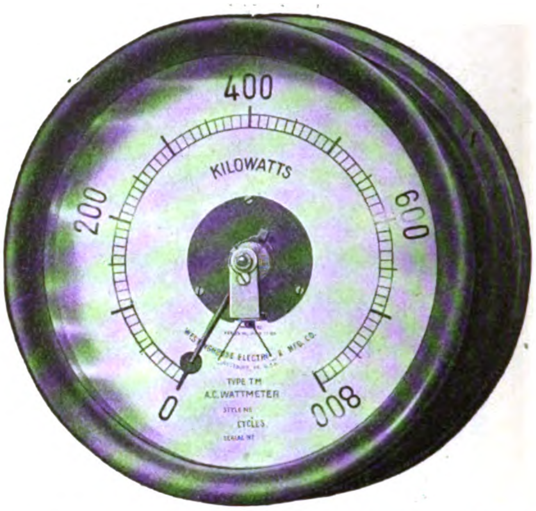
Wire chief's voltmeter, for telephone companies; ranges, from 3 to 750 volts; value of each scale division, from 0.02 to 5 volts. Weston Electrical Instrument Co., Waverley Park, Newark, N. J.



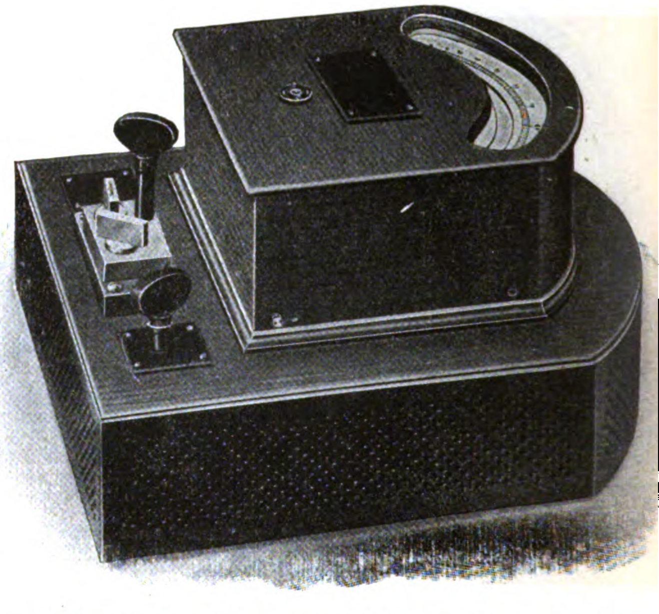
Visible, alternating and direct current wattmeter, for instructors' and students' use. Reliance Instrument Co., 1135 West Van Buren street, Chicago.



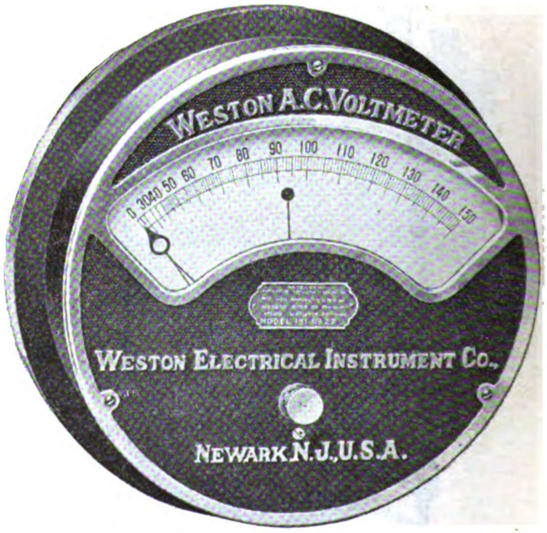
Single phase wattmeter, electro-dynamometer type, scale reading in kilowatts; for use as a switchboard instrument on 150, 300, and 750 volts. Kermel Apparatus Co., 145 Main street, Cambridge, Mass.



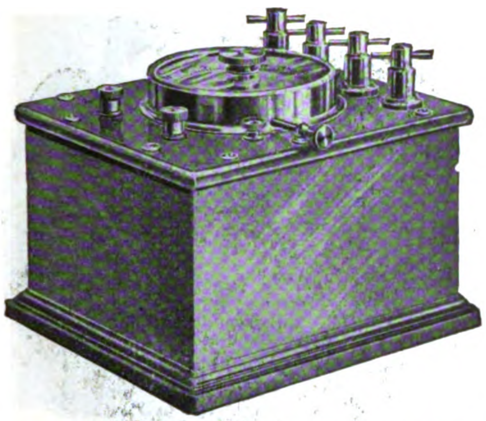
Round dial, 9 inch, polyphase, switchboard wattmeter, consisting of two electrically independent wattmeter elements on the same shaft for indicating the true energy in a two phase or a three phase circuit regardless of unbalance. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



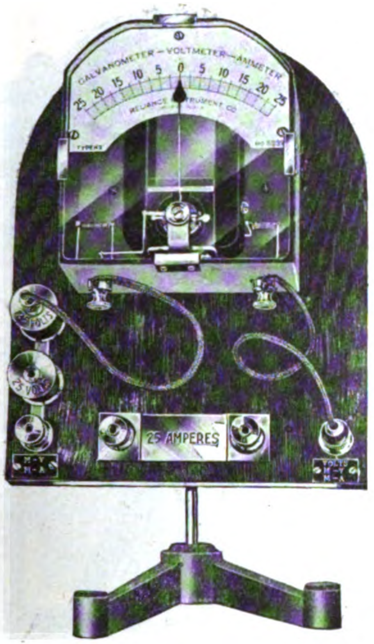
Siemens laboratory type, precision, electrodynamometer ammeter for direct and alternating current. James G. Biddle, 1211-1213 Arch street, Philadelphia, Pa.



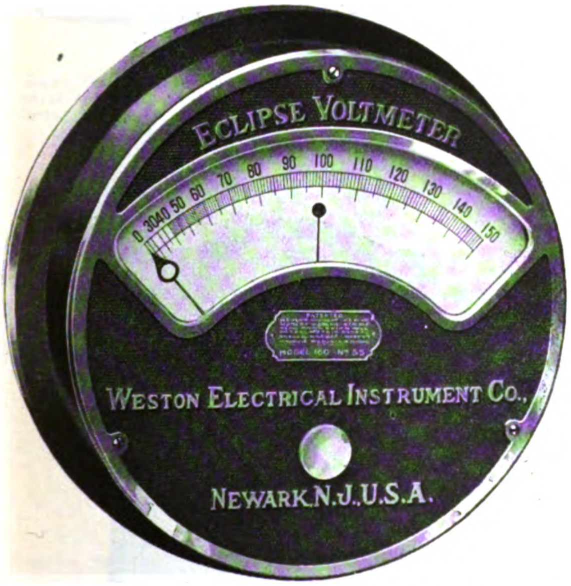
Switchboard type, alternating current, voltmeter; ranges, 75 to 750 volts. Weston Electrical Instrument Co., Waverley Park, Newark, N. J.



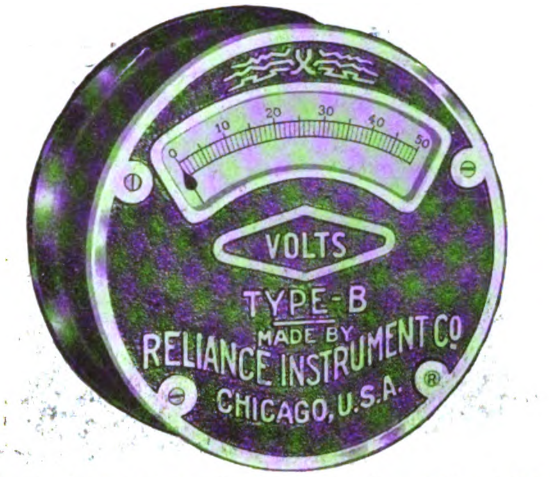
Precision wattmeter for use in calibrating watthour meters; has triple current range, 5-20-100 amperes. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



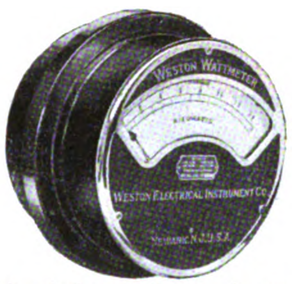
Visible, galvanometer, voltmeter, and ammeter combined, for instructors' and students' use. Reliance Instrument Co., 1135 West Van Buren street, Chicago.



Switchboard type, direct current voltmeter; diameter of case 7.25 inches, scale arc 5.25 inches; ranges from 75 to 750 volts. Weston Electrical Instrument Co., Waverley Park, Newark, N. J.

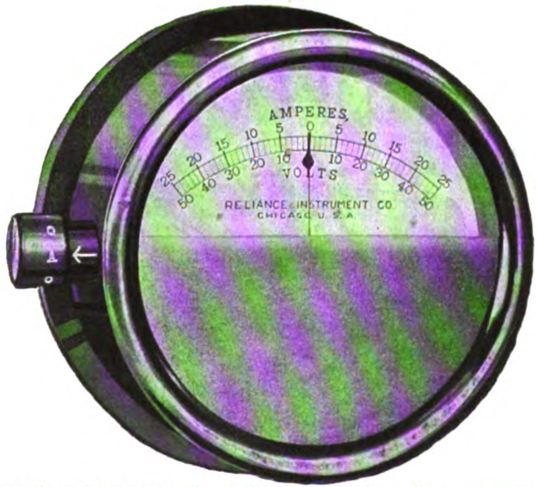


Switchboard, direct current, voltmeter; ranges from 0-75 to 0-750 volts. Reliance Instrument Co., 1135 West Van Buren street, Chicago.

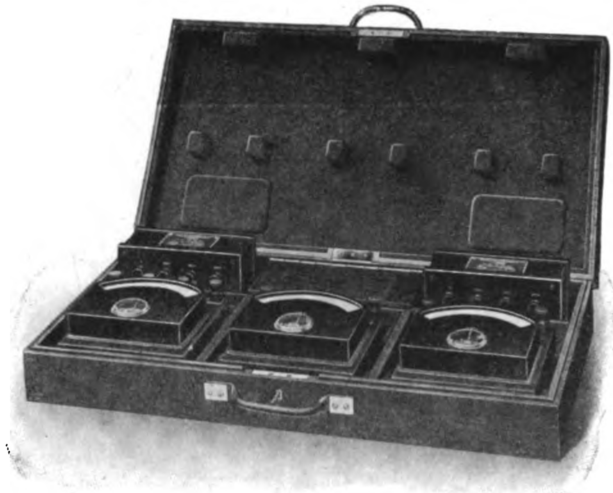


Semi-flush, switchboard, polyphase wattmeter; in capacities from 100 to 750 volts, 5 to 100 amperes, with scales from 1 to 150 kilowatts. Weston Electrical Instrument Co., Waverley Park, Newark, N. J.

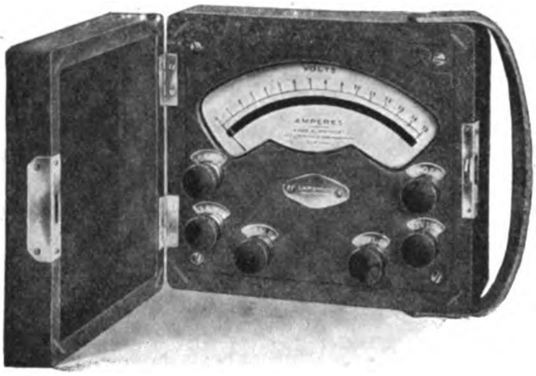
Hot wire instrument for direct and alternating current circuits; indicates accurately on high frequency circuits; made as a milli-ammeter, milli-voltmeter, ammeter, and voltmeter. Mohawk Electric Mfg. Co., 45 Lawrence street, Newark, N. J.



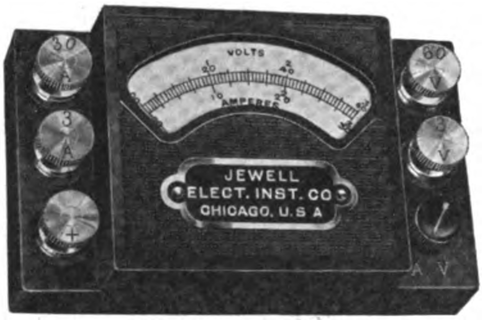
Switchboard, volt-ammeter, for individual lighting plants; a turn of the button on side of instrument changes it from a voltmeter to an ammeter, and vice versa; ranges, 75 to 150 volts, 75 amperes. Reliance Instrument Co., 1135 West Van Buren street, Chicago.



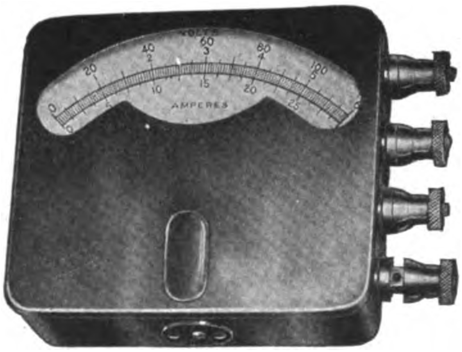
Siemens engineers' test set for direct and alternating current measurements, consisting of electrodynamometer ammeter, voltmeter, and wattmeter, with voltage multipliers, in one case. James G. Biddle, 1211-1213 Arch street, Philadelphia, Pa.



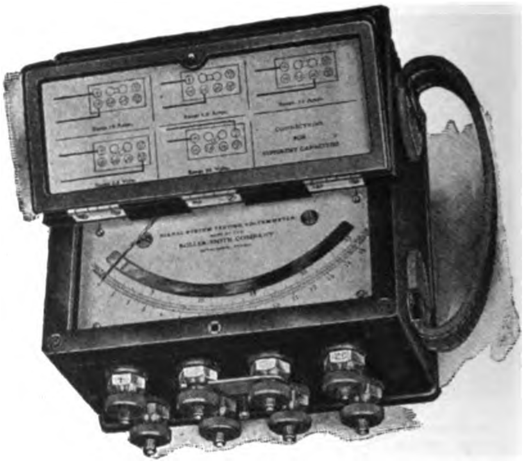
Four reading, portable, d'Arsonval type, volt-ammeter for direct current; for not over 130 volts and 30 amperes; equipped with zero adjuster. Louis M. Pignolet, 78 Cortlandt street, New York.



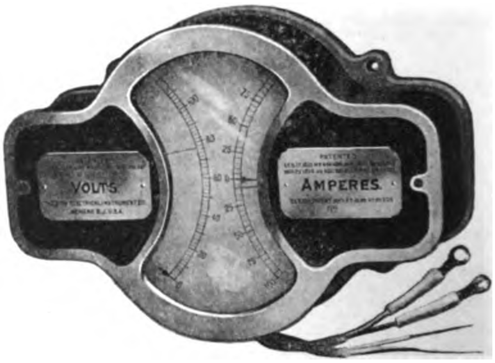
Pocket, portable, four reading, volt-ammeter, for direct current circuits, giving volt readings of 0-3 and 0-60, and ampere readings of 0-3 and 0-30. The arrow indicating switch is turned for volt or ampere readings as desired. Made by Jewell Electrical Instrument Co., 810 West Lake street, Chicago.



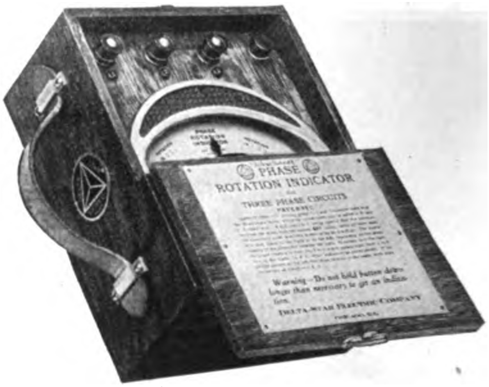
Miniature, portable, d'Arsonval, dead beat type, volt-ammeter, for direct current; equipped with zero adjuster. Louis M. Pignolet, 78 Cortlandt street, New York.



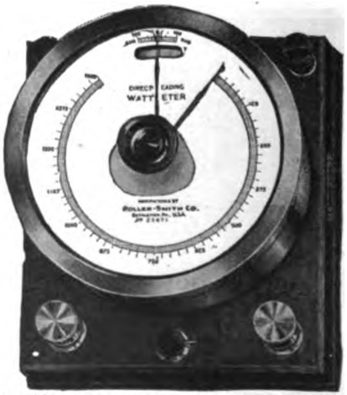
Portable standard type, direct current, signal system, testing volt-ammeter. Roller-Smith Co., 203 Broadway, New York.



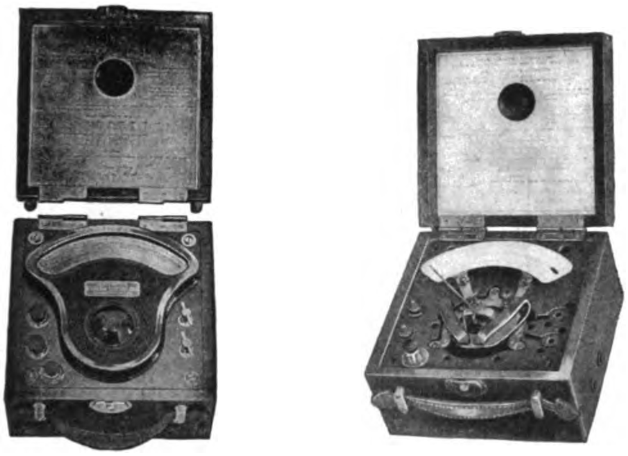
Direct current, duplex instrument—voltmeter and ammeter in one—for simultaneous reading of current and potential; ranges, 75 to 300 volts, 10 to 500 amperes. Weston Electrical Instrument Co., Waverley Park, Newark, N. J.



Portable phase rotation indicator, used for showing the phase rotation of polyphase circuits. Its use prevents the incorrect installing of motors, meters, and transformers, and eliminates errors in connections. Illustration shows a three phase instrument. Delta-Star Electric Co., 617-631 West Jackson boulevard, Chicago, Ill.



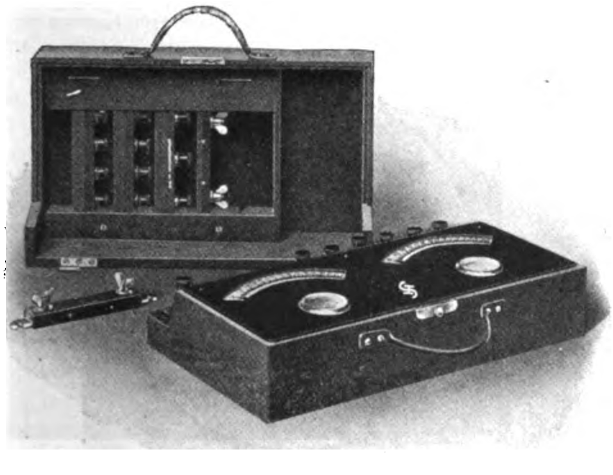
Torsion type, portable, alternating current wattmeter; in single an double current capacities for not over 150 volts. Roller-Smith Co., 203 Broadway, New York.



Cover removed.

Portable, single phase wattmeter, for use as secondary standard and for test work; capacity, 500 watts; maximum amperes, 5; maximum volts, 150; also made for voltages up to 750 volts, 200 amperes. General Electric Co., Schenectady, N. Y.

Portable, alternating and direct current wattmeter. Reliance Instrument Co., 1135 West Van Buren street, Chicago.



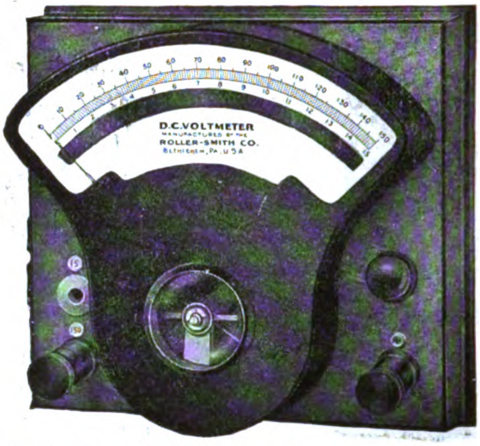
Siemens precision, direct current, moving coil type voltmeter and ammeter in one case, with shunts; for simultaneous measurements of current and potential. James G. Biddle, 1211-1213 Arch street, Philadelphia, Pa.

Siemens, precision, direct current, moving coil type volt-ammeter with shunts and multiplier for various ranges, in compact case. James G. Biddle, 1211-1213 Arch street, Philadelphia, Pa.

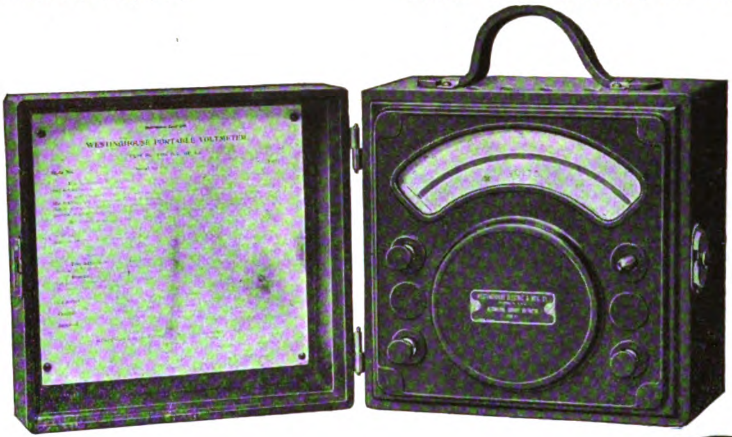
General service type, portable, alternating current voltmeter; **electro-magnet** movement; ranges, 75 to 600 volts. Roller-Smith **Co.,** 203 Broadway, New York.

Portable, laboratory voltmeter, for direct current circuits; for general testing work; particularly valuable where a long scale semi-portable meter is required. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

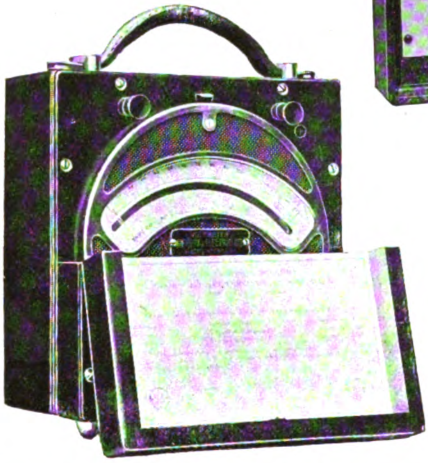
Alternating current, portable ammeter for testing and laboratory work; has long open scales; operates on the induction principle; current ranges 0-1 and 0-2, to 0-60 and 0-120 amperes. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



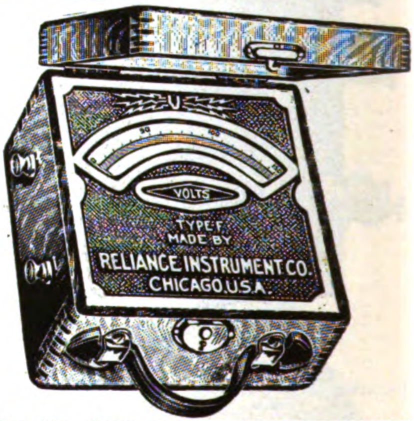
Portable standard type, double reading, direct current voltmeter, for work requiring dependability and precision; zero adjusters; mirrors under needle. Roller-Smith Co., 203 Broadway, New York.



Portable voltmeter (a.c. or d.c.), a direct reading instrument for general testing and laboratory work where especially high accuracy is desired; scales 0-75, 0-150, and 0-300 volts. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

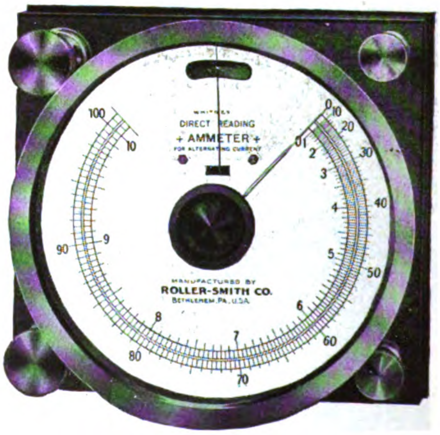


Portable, direct current voltmeter, designed for use as a secondary standard and for general testing purposes; made also as ammeter, milli-ammeter, and milli-voltmeter. General Electric Co. Schenectady N. Y.



Portable, direct current voltmeter; also made as milli-voltmeter, ammeter, and milli-ammeter; ranges, 0-150, to 0-750 volts. Reliance Instrument Co., 1135 West Van Buren street, Chicago.

Portable voltmeter for indicating on both alternating and direct current circuits; full scale deflection on 75 to 750 volts with self-contained resistance. Kermel Apparatus Co., 145 Main street, Cambridge, Mass.



Portable, torsion type, alternating current ammeter; operated by turning central button until pilot needle comes to zero, then reading direct from the long scale. Roller-Smith Co., 203 Broadway, New York.

[TO BE CONTINUED]

High Tension Line Materials

(HIGH TENSION SERIES—ARTICLE NO. 4)

Reliability of service is the most important asset of any high tension system. Experience has shown that the transmission line is the weakest link. The effort to strengthen this link has been continuous. In no other branch of line construction have there been as many radical different ideas put into practice as in the lines transmitting electrical energy at high voltages. An idea of the changes recently effected and impending may be gleaned from the following statement made by a prominent manufacturer of high tension line fittings. He says:

1. There has been in the past no standard for any voltage.

2. The general trend is toward the substitution of steel for wood in arms, pins, and poles.

3. The overhead ground wire is used on about 80 per cent. of the newer lines, as its effectiveness as a protection against static discharges is generally acknowledged.

4. Most lines of 66,000 volts and lower are built for one circuit, and another line is constructed when additional capacity is required, this being in accordance with the policy of syndicate control, and supply of large territories from networks of transmission lines.

5. There is a marked tendency to increase wire spacing, and many companies are now using much larger spacings than they formerly considered adequate for the lower voltages. This is due to various causes, such as the use of aluminum and copper clad steel wires, and provision for future increase in voltage.

6. There is a general improvement in the quality of recent construction, both new lines and reconstruction work, due to unsatisfactory experience with the old wooden arms and pins.

7. On account of the increased cost of labor a great deal of attention is now paid to the selection of a type of construction having a minimum installation cost.

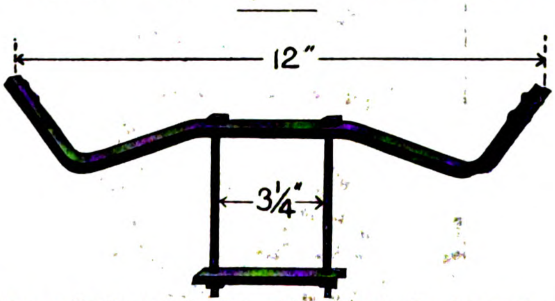
8. The tendency toward long span pole lines is mostly confined to those parts of the West in which the loads are widely scattered and of a temporary nature, and where the first cost of the lines must be kept down, experience having shown that this end is best accomplished by using a good grade of material and longer spans than by using an inferior quality of arms, pins, and poles, with the usual pole spacing.

In the past few years there has developed a rapidly increasing demand for a type of construction that will meet the conditions outlined above. It is this demand that the manufacturers of poles, towers, and pole line hardware have endeavored to meet.

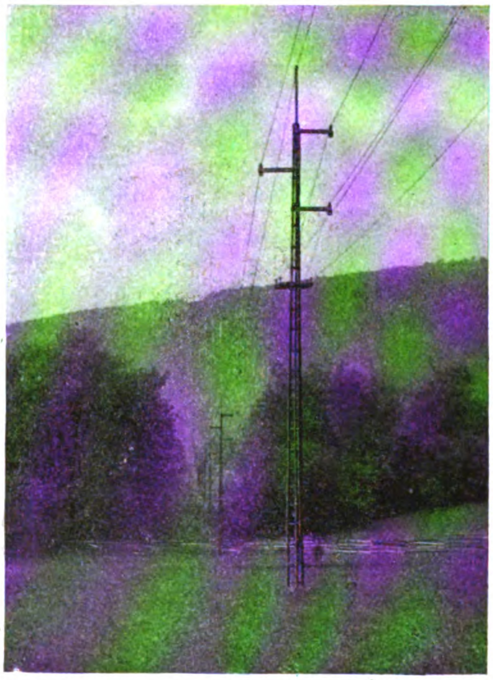
A number of types of pole line hardware for high tension transmission systems were shown in article number three of this series, published in the April, 1915, issue of the ELECTRICAL RECORD. In this article a number of types of poles and towers are illustrated. Wooden poles are rarely used. Some cement poles are used, but by far the greatest number of poles used are of iron and steel. The towers that are used are of iron and steel and are generally referred to as structures. There are many kinds and types of towers, including: flexible towers, strain towers, frame towers (called frames), high towers, and crossing structures.

The use of steel hardware in overhead line construction calls for an efficient protection against corrosion. A coating of pure zinc has been found to give the best results, and of the three methods of applying this coating the hot dip process alone has withstood the test of time and is used on 90 per cent. of the pole line hardware now manufactured.

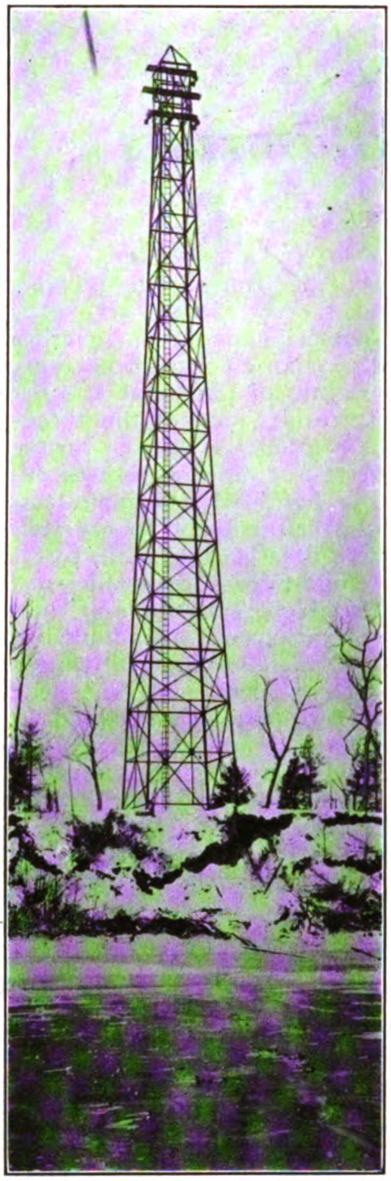
A table published in the Hubbard Reference Book gives extensive data on the subject of the methods employed by high tension companies in transmitting energy. This table gives details of the construction of 130 lines of various voltages built during the last four years, and includes the following information: name of company, location of line, length, voltage, frequency, style of pole, height, standard spans, type of insulators, wire arrangement, if overhead ground wire is used, line wires, transformers (type and connections), lightning arresters, and line transpositions.



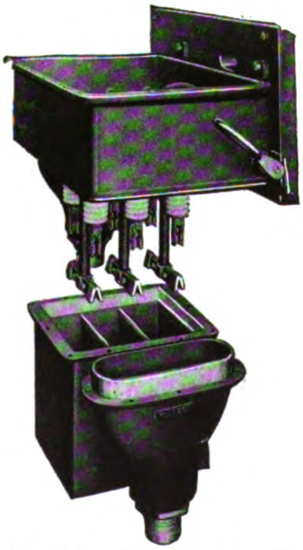
One piece malleable iron bracket with patented clip; japanned or galvanized. Line Material Co., South Milwaukee, Wis.



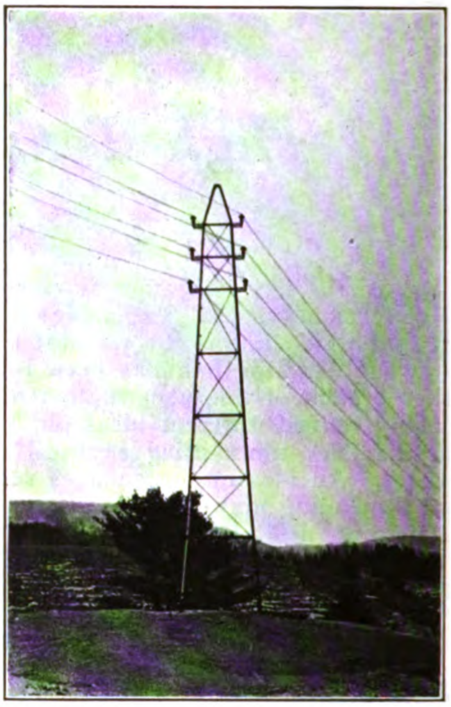
Bracket type, single circuit steel poles installed near Altoona, Pa., for the Penn. Central Light & Power Co.; spaced 300 ft. apart and designed to support ¼ inch steel ground wire. Made by Franklin Steel Works, Franklin, Pa.



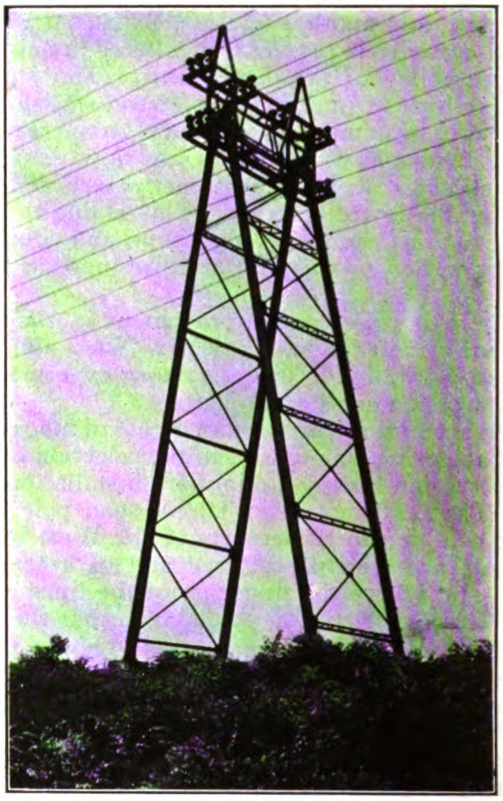
169 ft. tower, on 800 ft., 33,000 volt crossing of Central Maine Power Co., over main ship channel of the Kennebec river at Farmingdale, Me. The No. 2/0 copper strand conductors are carried back to anchor towers. Made by Archbold-Brady Co., Greenway avenue, Syracuse, N. Y.



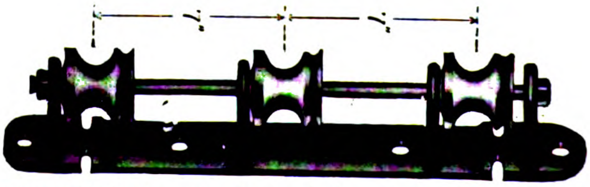
200 ampere, 10,000 volt, triple pole, single throw oil switch, with special bell chamber for entrance leads. Made by General Electric Co., Schenectady, N. Y.



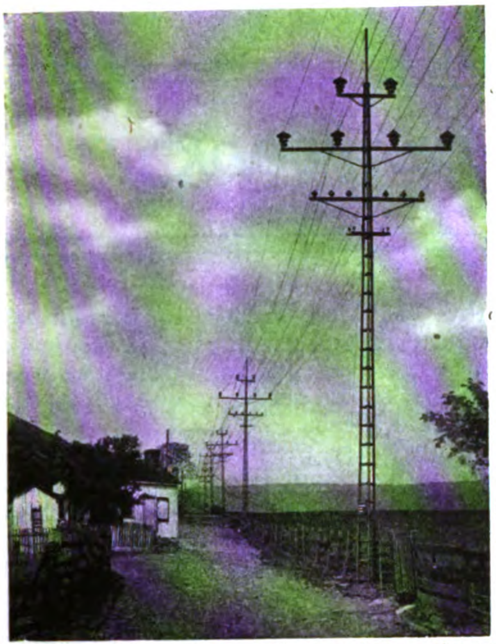
Double circuit 33,000 volt structure on 11-mile line from Pittsfield to Lee, Mass.; no ground wire used; line cables are No. 0 stranded copper, the standard span 400 feet. Made by Archbold-Brady Co., Greenway avenue, Syracuse, N. Y.



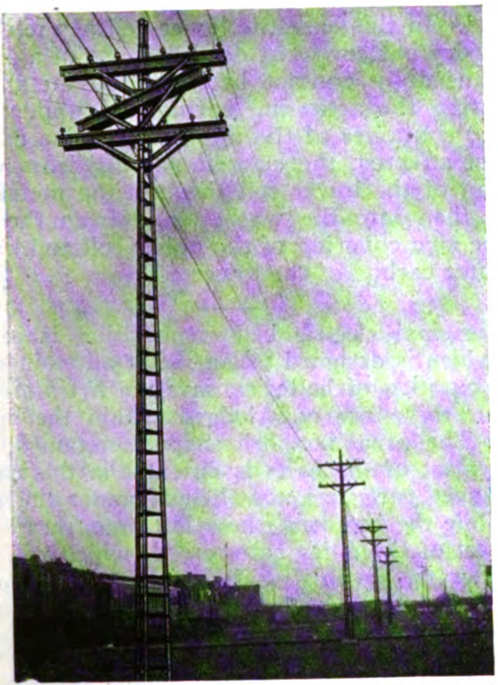
Tower of the Adirondack Electric Power Corporation on an 800 ft. span over the Mohawk river at Cohoes, N. Y.; 79 ft. high, carrying six No. 3/0 hard drawn copper cables with two ground wires and two telephone wires. Made by Archbold-Brady Co., Greenway avenue, Syracuse, N. Y.



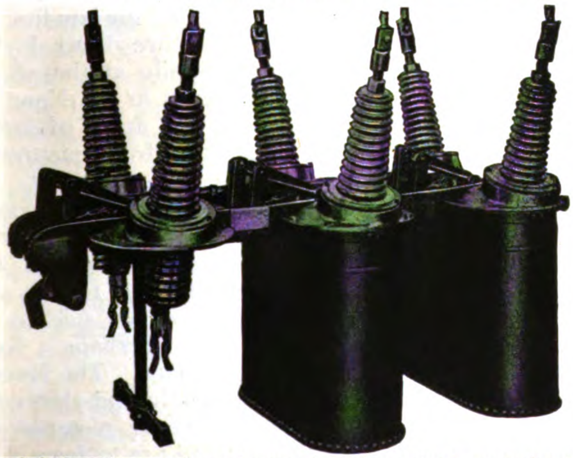
One piece malleable iron secondary rack, for screwing to wall or through pole. Line Material Co., South Milwaukee, Wis.



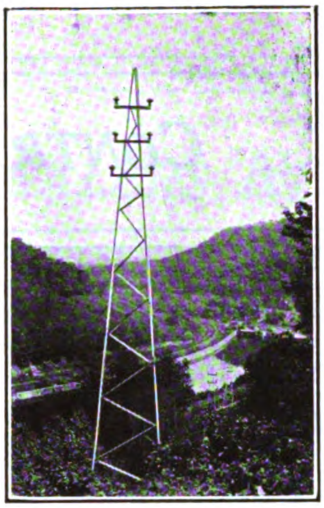
Arm and pin type, double circuit, steel transmission poles on line of Penn Central Light & Power Co., near Altoona, Pa.; spaced 200 ft. apart, transmitting 45,000 volts. Made by Franklin Steel Works, Franklin, Pa.



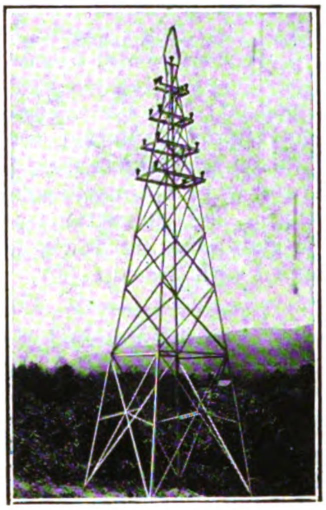
One type of steel transmission pole installed by Pennsylvania Tunnel & Terminal Railroad Co., at Sunnyside Yard, Long Island City, N. Y. Made by Franklin Steel Works, Franklin, Pa.



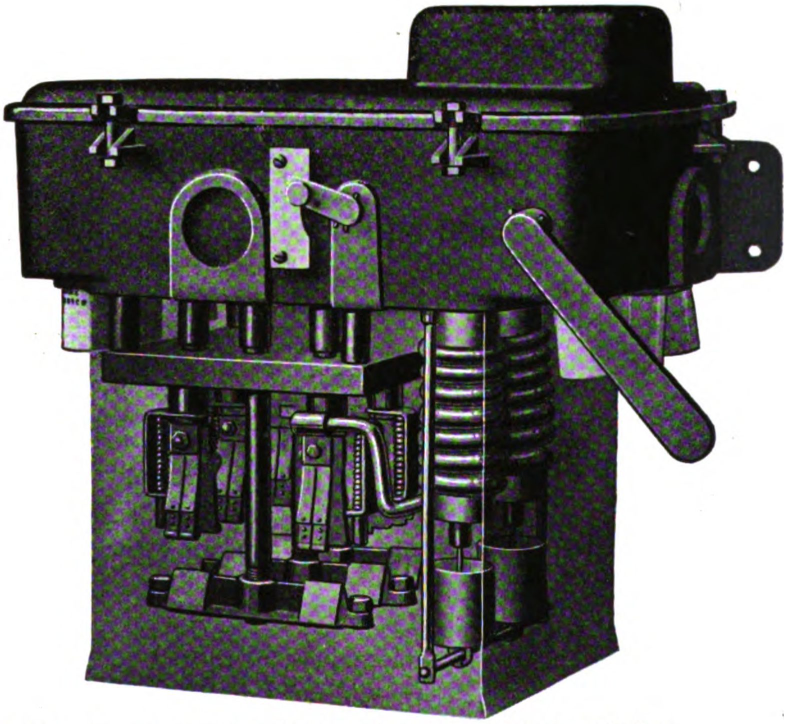
Oil switch for 22,000 volts and upward; self-contained, no isolated cells necessary; high rupturing capacity; operating mechanism similar for each pole of switch, and mounted on cover. Made by General Electric Co., Schenectady, N. Y.



Flexible tower, for high tension transmission systems. Made by Riter-Conley Mfg. Co., Pittsburgh, Pa.



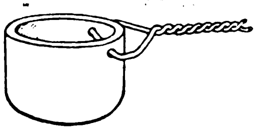
Steel strain tower for high tension transmission systems. Made by Riter-Conley Mfg. Co., Pittsburgh, Pa.



2,500 volt, weatherproof, automatic, oil circuit breaker for switching and overload protection. Made by Railway Industrial and Engineering Co., Greensburg, Pa.

CONTRACTORS' SCRAPBOOK

M. F. Libbey of Whitefield, N. H., writes the M. W. Dunton Co. of Providence of a soldering kink he has found of use in fixture hanging. By use of this kink the connections can be soldered without smoking or damaging the most delicate finish on ceilings. This kink consists of a home-made soldering cup made from cast iron pipe cap of ¾-inch or 1-inch size. Two holes are drilled as shown. They supply anchorage for a handle made of No. 12 galvanized telephone wire. Fill the cup with solder, he says, and when hot it will solder several joints without reheating. The connections are made with a pigtail with the ends pointing down, treated with Nokorode, and dipped with the cup.



Home made device for soldering fixtures. M. W. Dunton Co., Providence, R. I.

"A cent a watt," says the *National Mazda Stimulator,* "makes it simple to remember the prices of the 100, 200, 300, and 400-watt Mazda C lamps—$1, $2, $3, and $4, respectively. The 500-watt is $4.50, the 750 is $6, and the 1,000-watt is $7.[illegible]

The electric wiring for the Lawrence County Jail, near New Castle, Pa., will have a number of unusual features. The John Electric Co. of New Castle, Pa., will do this work. The outside of the building from top to bottom is of ⅜-inch steel plate with concrete floors on the first floor. The ceiling of the second floor is built of steel the same as the side walls. All outlet boxes are to be riveted to the steel work and all conduit will be run open in the inside and riveted every 4 feet so it will be impossible for the prisoners, who have access to this to get any part of it down without tools. All steel beams are to be bored and pipe passed directly through rather than bending down under. All fixtures are to be short cords with lock sockets. No method of fastening, other than riveting, will be allowed.

Owners of electric flashlights occasionally find the batteries in these flashlights going dead in a short space of time whether the lights are used or not. This is specially true of flashlights equipped with cartridge shaped dry batteries, consisting of two cells arranged in series. Three such cases have been reported recently. In the first case, the owner lived at the seashore and kept the lamp, when not in use, in a tin box to prevent rust due to moisture. The metal in the box furnished a path for the current to pass from the metallic piece in contact with the bottom of the battery to the metallic piece in contact with the lamp at the other end of the flashlight. This produced a dead short circuit. All forms of electric flashlights should as matter of precaution rest on non-conductors when not in use. If they must be kept in a tin box, see that the box is lined with a non-conductor. They should not be put on the back of a kitchen stove for safe keeping.

In the other case, the flashlight was of the fountain pen type. The circuit is completed by pressing the clip. This pen was put in a drawer in such a way that the clip was pressed continuously against the contact point. Of course the battery was short circuited.

A third case consisted of a fountain pen flashlight with a metallic cover. The light was turned on and off by pushing down on the upper part of the container. The upper part was actuated by a spring which broke the contact as soon as the pressure was released. In this case the lower cell of the cartridge shaped dry battery went dead because of a short circuit caused by contact between the metal washer supporting the actuating spring and upper edge of the zinc container of the upper cell. The upper cell was not affected, the current passing from the zinc covering of the lower cell through the metallic container, then into the washer, and from the washer into the zinc covering of the upper cell and back into the center carbon of the lower cell.

An original electric bell combination is in use at Paris which is designed to get rid of all trouble caused by the question of batteries, says the *Scientific American,* for these are now lodged within the apparatus itself. The usual box bell shape is retained, but the arrangement of the parts is different in this case. All the magnet parts are now lodged under the gong itself, while the box being now left free, serves to contain a set of three dry battery cells which will last for several years. In this way there are no connections to be made between the battery and bell, and the wires and push-button are the only pieces which need to be attended to.

An important phase of motion-picture photography is the use of artificial light outside the studio when conditions make it impossible to secure direct daylight. Pictures have been made successfully at the sea bottom, in mines, in factories, and even in the New York subway. For this purpose the best form of lamp is the portable multiple arc. For the subway pictures the Vitagraph Company used twelve twin-arc lamps. Two sets of six in series were connected across the 600-vol feeder circuit. The lamps were arranged in pairs on four posts 10 feet apart, making a total depth of abou 50 feet, and the camera was placed about 12 feet above the subway platform, flanked on either side by two lamps placed about 4 feet apart and perhaps 3 feet in front of the lens on a horizontal plane. The resulting pictures were perfect photographically and showed the traffic during the rush hours. These pictures were made for the city of New York and are to form a part of its exhibit at the Panama-Pacific Exposition.

CONTRACTORS AND DEALERS NEWS

The electrical contractors of Washington, D. C., have formed an association for the promotion of trade interests, good fellowship, and to meet the "onslaught of unjust rules and regulations promulgated from time to time by the local electrical department." It is the aim of this association to work harmoniously with the public. This association will hold meetings on the first and third Fridays of every month at the Builders' Exchange, 1220 New York avenue, N. W. The officers are: President, Robert Smith; vice-president, Joseph Randall; secretary, John J. Odenwald; treasurer, W. B. Watzel.

Another concern in New York, equipped with both alternating and direct current supply for testing work is the New York Electric Installation Co., Inc., 147 West 35th street. This company handles Peerless dynamos, motors, and fans.

Among the contracts now being handled by the Barker-Cole Electric Co., 114 N. Grand avenue, Lansing, Mich., at present are: Methodist Church at Corunna, knob and tube construction; school building at Flint, conduit construction, including both wire, call bell and fire alarm systems; thirty-two family apartment at Lansing, conduit; and the Baker-Clay Products Co., at Grand Ledge, Mich., about 250 h.p. in motors, 150 lights, mixed conduit and open work. This concern is just completing the electrical work in the factory of the Auto Body Co., at Lansing, where about 1,200 14-inch Abolite reflectors will be used for lighting and about 80 motors for power. The lighting is practically all general lighting and motor work is nearly all individual drive.

The F. M. Grant Electric Co., Cleveland, Ohio, has recently secured the following electrical contracts: a complete lighting system in galvanized iron conduit in an 8-story cold storage plant; a conduit installation for both light and power in an extensive 2-story metal stamping factory; a conduit installation and waterproof fixtures for the loading platforms of a large automobile factory; a complete galvanized iron conduit system, with several hundred galvanized condulet fittings for both light and power on the U. S. training ship *Dorothea*, which was formerly wired in wood moulding. Every foot of moulding is to be removed and a complete iron conduit system is to be installed from stem to stern and from keel to topmast under rigid government specifications. In addition to the above, the same firm has contracts for a 4-story addition to a fireproof office building, several large residences and a large 1-story addition to a factory.

Barrick & Dick, contractors and repairers, at 3807 Spruce street, Philadelphia, report they have been kept busy for the last few months making installations of every description, from the equipment of large electrical power plants to the placing of lighting, annunciator, call bell and burglar-alarm outfits, and in the making of all kinds of repairs. They are designing and building a large electric sign for the Pan-American Exposition, which will be erected September 15, 1915. They are also designing and installing a power plant for Emmanuel Barrick at No. 4010 Chestnut street, Philadelphia.

The Keller Electric Co., Inc., 1081 Main street, Dubuque, Iowa, is wiring the new parochial school of the Sacred Heart parish of Dubuque. The contract includes wiring for light, power, and various signal systems. This company is now installing complete electrical equipment on the Government boats *Warioto, Comanche* and *Denison*. The wiring will be in conduit throughout. The contract includes searchlights, arc lights, fixtures and generators. Each boat has a 7½ kw. turbine generator and a marble switchboard, also 100 lights, a 19-inch searchlight, and two 6-ampere arc lights. This company is finishing the wiring of a 7-story and basement building for the Becker-Hazleton Co. of Dubuque. The electrical equipment includes lighting and 40 h.p. in motors.

On June 1 Frederick Truscott & Son Co., electrical contractors and dealers in supplies, removed from 44 South Division street, Buffalo, N. Y., to larger quarters at 70 Exchange street, Buffalo.

V. P. McNamara, formerly in the electrical contracting business at 214 West B street, Seattle, Wash., has sold a one-half interest to G. E. Craig. These two men have organized the Union Electric Co. and removed to larger quarters at 323 Washington street. In addition to repair and contracting work, this company will deal in electrical supplies and fixtures.

Bremer & Lang, electrical contractors, have removed from 123 Liberty street, New York, to 59 Hancock avenue, Jersey City, N. J.

Thew & Luhr, electrical contractors, 110 North 15th street, Omaha, Neb., have acquired the business of the West Side Electric Co., formerly carried on at that address.

The electrical contract for the Boys' Industrial School, at Boston, Mass., will be done by the M. B. Foster Electric Co., 238 Devonshire street, Boston. This school will cost $300,000. The contract for the electrical work amounts to $36,000, and includes complete electrical installation for light, power, telephones, clocks, laboratory apparatus, fixtures, and also gas and air fitting, vacuum cleaning systems, and generators. The telephone system includes 40 telephone stations on a central switchboard of Holtzer-Cabot make. The electric clock system has 35 secondary clocks and a fire alarm system. The fixtures are to be standard city of Boston school house type. Three carloads of conduit will be used in this job. The Foster company also has the contract for the electrical work in the Niles Building in School street, Boston, Mass., a six-story fireproof building. The owners will install a private power plant which will furnish current not only for this building, but also for the surrounding buildings in the same block.

The Barnes-Pope Electric Co., electrical engineers and contractors, have removed from 178 Congress street to 93 Federal street, Boston, Mass.

The Bison Electrical Co., 259 Pearl street, Buffalo, N. Y., has recently been incorporated and is the successor of the J. C. Sterns Electrical Co., of the same address. J. T. Arundell, for seven years vice-president of the J. C. Sterns Electrical Co., is president and treasurer; B. H. Fisher, superintendent of the J. C. Sterns Electrical Co. for three years, is vice-president, and F. M. Smith, bookkeeper for the J. C. Sterns Electrical Co. for eight years, is secretary. The company is engaged in a general electrical contracting and supply business.

The Rochester Electrical Supply Co. has succeeded to the business formerly carried on by the Rochester Electric Contracting Co. at 9 East avenue, Rochester, N. Y.

W. M. Sheehan & Co., 114 Liberty street, New York, electrical contractors and dealers in electrical supplies, have been reorganized. J. M. Sheehan, president and general manager of the Upper Hudson Electric & Railroad Co., will act as president, and N. W. Dalton, formerly of the Bath Electric & Gas Light Co., and recently in charge of electric work for the Hartford Carpet Corporation, will act as general manager.

The contract for installing a complete electric lighting equipment in the canning factory of the H. C. Hemmingway Co., at Clyde, N. Y., has been awarded to the Hammer-Beach Electric Co., of Newark, N. Y.

The Union Electric Co., 323 Washington street, Olympia, Washington, has just contracted with the United States Postoffice at Olympia for 16 portable desk lamps of special design.

James G. Mitchell, 2637 South 15th street, Philadelphia, Pa., has been awarded the contracts for the electrical work in the new post offices at Cookeville, Tenn., and Jellico, Tenn. Both will be wired in conduit.

The Economy Electric Co., of Hamilton, Ohio, has the contract to install a lighting plant for the town of Shanidon, at Shandon, Ohio. This contract includes the wiring of 35 residences and eight stores.

The Frank N. Wade Co., 206 N. Main street, Springfield, Mass., will wire the German Turners Club house at East Longmeadow, Mass. This club will contain a billiard room, a dance hall, and a bar. The wiring is to be done in knob and tube, and the fixtures will be of the semi-indirect type. This concern will also wire a twenty-two apartment block with three stores, for John Lupien, at the corner of Huntington and North Main streets. They have just finished the roughing of thirteen three-deckers on Long Hill street and Pecousic avenue, Springfield. Eight of these apartments are owned by Frank B. Allen and five by Fred D. Robbins.

J. S. Eastman, 511 State street, Madison, Wis., has the wiring and installing of fixtures in the home of Suhr Brothers, at Madison. Specially designed compo-metallized fixtures were installed in the principal rooms.

The James Corr Electric Co., 205 S. 19th street, Omaha, Neb., has the contract for the wiring for the sheriff's residence and jail at Glenwood, Iowa. This is to be a combination two story building, wired throughout with conduit, and fixtures of the very best class.

The John L. Walker Co., Hamilton, Ohio, has the wiring contract for the new home of the B. P. O. Elks, No. 93 in Hamilton, which is well under way. The wiring will be in conduit throughout. This electrical equipment includes five panelboards, ranging between 8 and 22 circuit boards, specially designed for dimmer and other apparatus, besides main switchboard in basement with a 300-ampere, 220-volt, 3-pole main switch, also power service and various controls. There are also 75 push switches, 22 three-way switches, and 65 base receptacles. Another contract is for the country home of C. A. Shuler, south of Hamilton, Ohio, to be wired in conduit throughout. There will be 27 push switches, 8 three-way switches, 50 light outlets, 16 base receptacles, and a 10-circuit panelboard. Also to install an isolated plant for current supply to consist of switchboard, generator, storage batteries, and gasoline engine.

The Sterling Electric Co., of Minneapolis, Minn., has just closed a contract with the city of Mankato, Minn., for a "white way" system, consisting of 61 Cutter "Broadway" posts, fitted with G. E. Novalux top, and 20 ampere 1000-candle power Laco nitrogen lamps. The contract price is $10,000.

T. Frederick Johnson, 99 John street, New York, has the contract for electrical work in Public School No. 12, at Frisby and Benson avenues, New York. The panelboards will be furnished by the Metropolitan Electric & Mfg. Co., and the fixtures by Rosenbaum & Philips. The wire will be rubber covered. Mr. Johnson will also wire six stations on the Liberty avenue Line in Brooklyn, N. Y. This contract amounts to about $20,000.

The Economy Electric Co., of Hamilton, Ohio, has recently sold and installed a 15 h.p. direct connected unit, 110 volts, in the new picture theatre of Peter Blum at Mt. Healthy, Ohio. The engine is a special electric, natural gas Foos direct connected to a Lincoln generator, and supplies current for the entire lighting system of the building and two picture machines.

The contract for the electrical work in the high school building at Towanda, Pa., has been awarded to the Dauphin Electrical Supplies Co., 434 Market street, Harrisburg, Pa. This will be an all-conduit job, embracing programme clocks and system of door bells, telephones, and electric lighting. This company has also been awarded the contracts for wiring and equipping the high schools at Shamokin, Manheim, Mt. Carmel, and Canton, Pa. The company is completing the Emerson-Brantingham building at Harrisburg, Pa., also the new School of Mines at State College, and the Daman cottage and passenger station at Elizabethtown, Pa. J. S. Musser, president of the company, reports plenty of profitable prospects on the horizon.

The Langstadt-Meyer Construction & Supply Co., 127 South Washington street, Green Bay, Wis., will do the electrical work in the new Deaconess Hospital at Green Bay. This company also has the contract for all the electrical work in the new Grand Theatre in Washington street, Green Bay. The latest type of equipment and fixtures will be used here.

The Bothwell-Guthman Electric Co., 15 Spring Common, Youngstown, Ohio, reports contracts for two Ohio centralized schools, one at Ravenna, the other at Austintown. Both schools will be equipped with 15-h.p. gas engine generator, 180 amperehour storage battery, deep well pumps, call bells, and 160 wiring outlets.

The Clefton Co., of Owatonna, Minn., is wiring the Kenyon and Milltown schools in that part of Minnesota. The equipment of the Kenyon school consists of conduit throughout, and includes 5 motors, 208 light openings, programme clocks, bells, fire alarm stations and bells, and lighting fixtures. The Milltown school installation consists of conduit on two floors with knob and tube wiring on the upper floor. There are six motor circuits for fans, air washer, manual training department, deep wells, and vacuum cleaner. The clock and fire alarm systems are the same as those in the Kenyon school.

The Axthelm Electric Co., 209 Fourth avenue, Pittsburgh, Pa., has been awarded the contract to install wiring for light and power, the lighting fixtures, interior telephone system and clocks, in the McKeesport High School, at McKeesport, Pa. The entire system will be installed in conduit. Work will be started about July 1, 1915.

The Beattie Electrical Co., 324 West 4th street, Cincinnati, Ohio, reports the following contracts in hand: Lucas County Orphans' Asylum, at Maumer, Ohio; the contract calling for one 55-kw. Triumph generator; stadium Woman's Building, at the University of Cincinnati; also the Warsaw school building in Cincinnati.

Louis P. Maynard, 21 Everett street, Fall River, Mass., has the contract to install the electrical equipment in St. Mary's Roman Catholic Church at Mansfield, Mass. Crouse-Hinds switchboards will be used, controlling the supply to semi-indirect lighting fixtures and a 3 h. p. organ motor. Steel conduit will be used throughout. This will be the only building in Mansfield with underground electric service.

Andrews Electric, Inc., 17 North Main street, Brockton, Mass., is wiring the new rectory at that place. The wire will be installed in BX cable. The installation includes bell and speaking tubes for the entrances, and a 7 station intercommunicating telephone system for the apartments.

The contract for wiring a new $25,000 house and garage on Galt avenue, Louisville, Ky., has been given to the Neal Electric Co., 209 South Sixth street, Louisville. This contract covers the wiring only, a conduit job. Another wiring job recently taken on by this company is in the Rally apartment building in Cherokee road, Louisville. It is a knob and tube job, and also includes both vestibule letter box and telephone system.

The storage building at 318 Longworth street, Cincinnati, Ohio, will be wired by the Beattie Electrical Co., 324 East Fourth avenue, Cincinnati. Lead-covered cable protected by conduit will be used throughout, thus preventing the likelihood of corrosion or short circuit due to dampness or condensation.

The Barnes-Pope Electric Co., 93 Federal street, Boston, Mass., has the contract for the electric work in the new bank and office building now being erected by the Massachusetts Trust Co., in Huntington avenue. The first floor will be occupied by the bank. The wire will be in steel conduit throughout. The fixtures will be installed by the McKenney & Waterbury Co. Other electrical contracts now in hand by this company include the following: new weave sheds for the Naumkeag Steam Cotton Co., Salem, Mass.; addition to mill for the Bates Mfg. Co., Lewiston, Maine; addition to the Ocean House, Swampscott, Mass.; gymnasium for the Worcester Academy, Worcester, Mass.

Piepkorn & Henning, 236 West Water street, Milwaukee, Wis., will wire a new two story and basement bank building at Madison, Wis. Conduit will be used throughout.

Frederick Truscott & Son Co., 44 South Division street, Buffalo, N.Y., have the contract for the electrical equipment in the new building of the Buffalo Meter Co. This is an all concrete factory building of the latest design. The electrical equipment includes light, power, telephone, fire-alarm, and fixtures. The service will be taken from the local power company at 2,300 volts, 25-cycle three-phase. The contractors will furnish primary panels, transformers, and the necessary wiring. All the work is to be done in rigid iron conduit concealed in the columns and floors slabs.

The Richmond Electric Co., Richmond, Ind., will wire the German-American Bank Building. Brascolite fixtures will be used throughout.

W. A. Naddy, 2831 West Second street, Duluth, Minn., is wiring a new building in West 29th avenue, Duluth.

The Fitch Electric Co., 1005 East 105th street, Cleveland, Ohio, is equipping the different apartments in the Garfield Bank Building at St. Clair and East 105th street, Cleveland, with intercommunicating Connecticut telephones, desk standards, instead of one call buzzers. This company has a contract to wire a new 6 suite apartment in Overlook road, Cleveland Heights, for Mrs. Arnold Roth. This building will be equipped with Connecticut telephones, also with a 3-circuit reliance automatic clock. Each suite will have 12 base plugs to accommodate reading lamps, and other devices.

Wm. G. Reuter, of Cincinnati, Ohio, has the contract to rewire the Johnston Building. The entire job will be done in metal molding and conduit.

The Walker, O'Byrne Electric Co., of Springfield, Mo., reports that electrical contract work is progressing on the Landers Building, and the Herr-Andres Investment Building. Both are fireproof structures and will be wired for light and power, entirely in conduit.

The Hawkins Electric Co., 119 South Limestone street, Springfield, Ohio, will wire the shop of the United Cigar Stores Co. at that place. Other recent contracts obtained by the Hawkins Co. include the Knights of Columbus Bldg., for lamps, electric elevator, and theatre equipment; the lighting of the new County Infirmary; the wiring and equipping of St. Joseph's parsonage; the Fred Harwood residence in Elmwood place; and the Belmont M. E. Church.

Saylor Bros., of Lawrenceville, Ill., have the contract to install the electric wiring and fittings in a new store and office building at that place.

The Burgess Electric Co., Duluth, Minn., has been awarded the fixture contract for the Brewer flats located at Sixth avenue East and First street, Duluth. Another contract is for the new residence of John Klosnowsky on East Jefferson street, Duluth. Both buildings are being equipped with Calcite semi-indirect bowls.

Thomas J. Daly, 22 Boylston street, Cambridge, Mass., will wire the new $30,000 wood frame dwelling for Mrs. Minnie Fay, at that place. Rigid conduit will be used throughout. The contract includes a flush metal intercommunicating telephone system and an Arco vacuum cleaning system.

The Central Station Equipment Co. has recently been established at 114 Liberty street, New York, for the purpose of carrying on a general engineering and construction business. The officers are John Sarano, president; F. C. Joutras, vice-president; James Landers, secretary and treasurer. This company has just closed contracts for ornamental outdoor lighting systems at Allenhurst, N. J., and Port Jervis, N. Y.

Peet & Powers, 70 East 45th street, New York, will wire the new four-story residence at 11 East 95th street, New York. The contract calls for 30 per cent. para wire, galvanized conduit, and Caldwell type outlet boxes.

Fred Tischer, 612 Twentieth avenue East, Duluth, Minn., will wire and install fixtures in the new flat building at 515 North Third avenue East, in that city. In both living and dining rooms 16 in. bowls will be suspended from the ceiling, one and two light fixtures being installed in the rest of the rooms.

Electricity on Warships

A writer in a recent issue of *Edison Life*, published by the Boston Edison Company gives a brief summary of the many uses to which electricity is put on board modern sea-going war craft. In addition to operating telephones, indicators of various kinds, searchlights, cranes, capstans, winches, cook stoves, turning turrets, hoisting ammunition, and many other things, he says the refrigerating plant alone consumes over 110 h.p. and will supply the equivalent of 60 tons of ice per day.

The electrical system, he goes on to say, is supplied with current from four 300 kw. generators, each driven by a two-stage Curtis turbine at 1500 r. p. m. These machines supply direct current at 125 volts to various circuits on board.

There are two dynamo rooms, each complete, one located forward and the other aft, so that in case of accident to either section of the vessel a complete plant remains and the efficiency of the ship is not seriously impaired.

The system is further safeguarded by there being two distribution rooms with distribution boards, so connected that either generator switchboard can supply both.

The ventilation of the ship is accomplished by 49 ventilating motors, capable in all of delivery of 289,000 cu. ft. of air per minute. Were these to be shut down for a few hours the ship would not be habitable.

The old system of pulling a trigger to fire a gun has been done away with except for the smaller guns, and now all guns are fired by an electric current heating a fine wire set in a bed of guncotton, which is exploded by the heat of the wire and in turn explodes the powder.

The steering of the ship, instead of being done by the old fashioned wheel, is done by a small controller rather similar to that on the air brake on a trolley car, which operates a 150 h.p. motor so geared as to operate the rudder. This is a new departure but has proven very convenient and successful.

The installation of the gyro compass, the invention of an American, Elmer D. Sperry, has marked one of the great advances in the submarine. Previous to this invention the compass was of the magnetic type in common use on shipboard. In a submarine where of necessity the compass is completely surrounded by the metallic shield formed by the hull, and is in close proximity to numerous variable magnetic influences, it was always a matter of grave doubt whether the compass needle was pointing to the north or to the East or west or even south, or was perhaps shifting from one point to another whenever the boat submerged. The uncertainty as to where you would be when you came to the surface after a dive was hardly the best thing for efficiency. Thanks to Mr. Sperry's invention, the true course of the boat is always known, for his compass depends upon the rotation of the earth about its axis and has nothing magnetic about it.

This compass, in addition to always pointing to the true north has about 290 times the directive force of the old fashioned compass, or in other words, requires about 290 times as much force to be exerted to pull it to one side.

While the submarine has always been dependent upon its electrical equipment, he concludes, the modern battleship is no less so. On a dreadnaught today were the dynamos to break down almost the only functions that could be performed would be the use of the boilers and main engines. No turret could be trained, no gun elevated, no ammunition procured and no torpedo or gun fired except by the most laborious of methods.

GLEANINGS FROM THE N.E.L.A. QUESTION BOX

Reprinted from the Bulletin of the National Electric Light Association.

Define the terms "reactance coil" and "choke coil" and state under what conditions the two are used.

E. C. Stone—The terms "reactance" coil and "choke" coil are synonymous, and apply to any winding of electrical conductors that will take less current when excited with an alternating current of given voltage than when excited with a direct current of the same voltage. This will occur in any spiral winding where the magnetic field surrounding the conductor links with a number of the turns of the winding. With such an arrangement the magnetic field resists the change of current in the conductors, thereby setting up a counter emf which is proportional to the frequency of the alternations and additional to the counter emf due to the current flowing through the resistance of the winding. This counter emf, due to the magnetic field is known as reactive drop, and, when added in quadrature to the drop through the resistance for a given current, will give the voltage it is necessary to impress on the coil and drive any given current through it.

With the direct current there is no change in the magnetic field after it is once established and therefore no reactive drop. Reactance coils or choke coils are used where it is desirable to limit the current which can be produced by a given voltage, the advantage of such a coil over a straight resistance being that the power consumed with a given current flowing is much smaller.

What are member companies doing to overcome the high cost of replacing arc lamps with nitrogen units?

E. M. Ellsworth—Commercial multiple-arc lamps which our company lends and maintains free of charge are being rapidly replaced by type C mazda lamps in the following manner: The lighting solicitor in the district interviews the customer and invariably obtains his consent to have his electrical contractor hang two or three new units on trial with no obligation on the customer to purchase. The appearance of the store is thus improved to such an extent that the customer is willing to make additional expenditures for the new type of lighting. By this method we have replaced 102 arc lamps during the past year.

Frank W. Smith—Several different types of fixture are on the market for use with type C lamps and much consideration is being given to specially designed fixtures, with particular attention to the matter of ventilation.

In New York City the central station companies have rather generally adopted a ventilated container placed within the existing casing of the arc lamps formerly in use and in substitution of which the type C lamps have been placed. This has the advantage of slightly limiting the scrapping of existing equipment and reducing materially the investment involved in changing the lamps.

The arc lamp casing is altered so as to improve the ventilation and with the container makes the fixture practically waterproof.

What are the advantages in using electricity or gas directly applied to industrial processes in clothing, shoe, wood-working and metal factories over those of the usual system of supplying high-pressure steam from a boiler plant?

Douglass Burnett—I do not believe that any statements relating to definite industries and based on actual study or experience are at hand on which to make an intelligent reply to this question. Speaking generally, the advantage to the central station is that larger business would result, and to the user that he could either save money or gain in flexibility of control. It is the old question of the central station versus the steam plant.

In Baltimore we believe that there is an immense field for the supply of gas in substitution of steam for use in certain industrial manufacturing processes, and our new industrial gas schedule, recently published in Rate Research, is meant to develop this field. We believe that with the extension of the use of industrial gas it will be much easier to sell electric power, because manufacturers will become convinced that it is no longer necessary to operate steam plants.

T. R. Hay—The advantages of using electricity as compared with steam in the industrial processes of clothing, shoes, wood-working and metal factories are cleanliness, better light, reliability, flexibility, decreased up-keep, minimum unit cost and maximum production, constant speed for all loads and the elimination of dirty, power consuming, inflexible lines of shafting.

Gas motive power may be satisfactory as to cost and up-keep when first installed, but before long the advantages as compared with steam are not manifest and it is not nearly as reliable or as economic so far as unit cost and size of production are concerned.

Of what material and how thick should a switchboard panel be for 4000 or 6000 ampere carbon-break circuit-breakers for 440-volt alternating-current service.

C. G. Schluederberg—Slate is considered good practice and in fact is regularly used on panels for 440-volt alternating-current service. The strength of slate is between two and three times as great as that of marble.

For 4000 to 6000 ampere carbon circuit-breakers the upper slab of the slate panel on which the breakers are mounted should be of 2½ inch thickness. Boards of this type are usually built with the panels composed of three sections, the upper one being devoted exclusively to the mounting of carbon circuit-breakers. This permits of mounting the breaker on the slab at the manufacturer's plant, and is the form most convenient for assembling switchboards at their destination.

Please inform us what is general practice among the largest companies in regard to grounding transformer case?

P. E. Jones—This company grounds all station transformer cases, but does not ground line transformers.

Ross B. Mateer—Transformer cases of all high-tension banks are grounded.

The use of 2200-volt motors does not necessitate small transformers except for lighting purposes. The neutrals of such transformers are generally grounded.

E. Stanley—Operators are entitled to the protection that results from grounded cases. All transformers should be so built as to stand their guaranteed insulation test when the cases are grounded.

Has anyone had occasion to estimate the revenue per annum per 16-candle power lamp or its equivalent, (1) for residential and (2) for business purposes?

B. F. McGuire—We have our customers classified by kinds of business and from our records have obtained the income per 16-c.p. lamp on all classes of customers using current for residential or business purposes. The revenue from residential lighting is $.92 and from small stores is $2.16.

Do member companies rewind or repair transformers punctured by lightning? Are there repair shops that make a specialty of such work? If transformers are not repaired what disposition is made of them?

W. S. Hays—This depends upon the extent of the repairs or work to be done. Very often it is less expensive to return the transformers to the manufacturer for repairs. In cases where repairing would be too expensive it is usual practice to apply the old transformer credit on a new one. There are several transformer repair shops, but the manufacturer's guarantee is worth the small additional expense over the cost of doing the work yourself or at some jobber's. Of course in the larger companies there might be enough of this and other repair work to warrant having expert repair men on the job. You would then save freight and overhead charges and the expenses of the manufacturer's repair cost.

S. P. Hunt—We have found that it rarely pays to rewind or repair lighting transformers which have been injured by lightning or burned out by overload. It is usually better and cheaper to arrange an exchange with the manufacturers.

William Riley—We rewind and repair all of our transformers regardless of what the defect may be, and our standard of workmanship, as shown by the life of repaired transformers, is equal to that on any new piece of apparatus.

Will member companies kindly inform me as to their classification of 220-volt motion picture arc lamps in use on either alternating or direct current? Are they power or light, and why?

R. F. Bonsall—The Baltimore Company classifies motion picture machines as power for the reason that these do not require either renewals or trimming on the part of the company.

F. B. Lewis—In Los Angeles, current for motion picture arc lamps is classed as power, for the reason that it is not considered a means of illumination. Another reason that might be given is that in the alternating current districts motor-generator sets or rectifiers are commonly used, and the energy metered by the company is therefore properly termed power.

Rome C. Saunders—This company classifies its 220-volt motion picture arc machines as power apparatus. We collect a minimum charge of $1 per horse-power of the active load of the machine, which is usually from three to five horse-power. If these machines were classified as lighting apparatus, the minimum charge of $1 would be insufficient in view of the fact that from three to five kilowatt capacity in transformers is required. Furthermore, the rate for power is much lower and consequently the customer obtains a lower monthly bill.

Frank W. Smith—This company treats photographic arc equipment including moving picture machines, supplied from its alternating-current mains as power equipment, the following rider within our schedule of rates providing for this service:

Rider 23 PHOTOGRAPHIC ARC EQUIPMENT.

It is further understood and agreed that as the arc lamps supplied under this contract are to be used for photographic purposes only, and are not part of the lighting equipment, current where metered separately, will be supplied at the usual power rates.

It is understood and agreed that the consumer shall furnish all lamps and carbons, trim and otherwise care for, and maintain the equipment.

M. C. Tilman—Moving picture arc lamps, both 110 volt and 220 volt, are classed as power loads and billed at our regular direct or alternating-current power rates, as the case may be, under tested maximum demands.

We treat such installations as power loads (1) because they are served from our regular power circuits and do not require for their satisfactory operation the close regulation of our lighting circuits; (2) because the loads occur for the most part at a time when our distribution system is not heavily taxed and consequently do not entail extra distribution and station capacity; and (3) because our alternating-current users of such apparatus employ motor-generator sets to supply direct current to the arcs, since our 25-cycle service is not suited for moving picture arc lamps. Such users are billed at power rates and to avoid discrimination we bill all users of moving picture arc lamps at power rates.

This company wishes to renew long term contracts with one or two of its largest customers. We are unable to decide what allowance to make in rate for the future increase in lamp efficiencies. Do member companies expect to change rates from a wattage basis to an illumination basis? Is the candle-power likely to be the unit of the future in rate making? We would appreciate any views touching on rates for high efficiency lamps?

C. S. Walton—The increasing efficiency of lamps seemed at one time to be a menace to the future income of central stations, but to counterbalance this we have the increasing demand for illumination which apparently has kept pace with the lamp improvement, resulting in a better pleased public, which, in these days, is most important.

The wattage basis seems to be the correct one and will probably remain so. It is reasonable to suppose that as the subject of load-factor is getting to be more and more understood it will ultimately be a controlling influence in rate making. It is unthinkable to advance a customer's rate per kw.-hr. because of an up-to-date installation of lamps.

Electric current furnished by the New York Edison Co., was relied on as a source of energy by many of the contractors engaged in working on the new Equitable Building, New York, which has just opened for business. In excavating and building the foundations for this structure the contractors consumed 1,281,906 kilowatt-hours. This building contains 48 high-rise elevators, operating between the first and upper floors. Some are local, some express, some local-express. A combination passenger and freight elevator that travels from the sub-sub-basement to the 37th floor, rises through 546 feet, 8 inches. Besides these there are four low-rise elevators for local use in the lower part of the building. All are electrically operated.

RECENT LEGAL DECISIONS

Change of Current—Expense of New Fixtures

A city which has the right to impose proper conditions to secure a suitable and adequate service to the public, may not only impose these conditions in the first instance, but it may impose conditions after the grant of the franchise, subject only to the condition that it may not impair the obligation of any contract made with the public service corporation. But, not even by contract, can the city convey away its right of regulation under the police power.

A public service electric corporation changed the nature of the current supplied, but it was not done capriciously. It was held, in an action by consumers against the company, that the latter was not bound at its own expense to alter the consumers' fixtures so that they would be adapted to the use of the new current, even though many of the fixtures had been bought from the company, and were suitable only for the current formerly used.

Hunt v. Marianna Electric Co., Arkansas Supreme Court, 170 S. W. 96.

Reasonable Time to Repair Broken Wire

An action for the death of a person who was killed by contact with a heavily charged electric wire belonging to the defendant was tried on the issues of wantonness and simple negligence, in which wilfulness did not enter, the negligence or wanton act counted on having reference to the defendant's leaving the wire exposed and hanging in the street subsequent to its having been broken and becoming detached from its fastening, and not on an averment or proof of negligence or wanton act as to stringing or fastening the wire to prevent its falling into the street. It was held that the trial court erred in refusing to charge that the defendant company was entitled to a reasonable time after the wire fell to repair or remove it, and if the deceased's injury occurred before the expiration of such time, the plaintiff could not recover. Judgment for the plaintiff was reversed and a new trial granted.

Birmingham Ry., Light & Power Co., v. Jackson, Alabama Court of Appeals, 63 So. 782.

Converson of Power Current to Lighting Uses—Right to Injunction

An electric light company, which furnished electricity for both light and power, in accordance with Michigan Public Acts 1909, No. 106, filed with the Michigan Railroad Commission its rates for lighting service and for power service. The rates for lighting service were considerably lower than those for power service. Outside the premises of one of its customers, the owner of an industrial establishment, the company, through a transformer, reduced the electricity carried upon its wires from 2,300 volts to 440 volts, and carried the current into the customer's premises at the latter voltage. After being received there it was used at that voltage to run certain motors which furnished power for the operation of the plant. The customer then ran the current again through a transformer, reducing the voltage to 110, and it was then used for lighting purposes within the plant. In a bill for an injunction by the light company it was held that, as to allow the defendant to make such use of the current would work a discrimination against others, the company was entitled to an injunction to prevent such use. If the defendant felt himself aggrieved by reason of excessive charges, his remedy was open through a proper application for relief to the Railroad Commission.

Alpena Electric Co. v. Kline, Michigan Supreme Court, 146 N. W. 652.

Regulation of Rates—Effect of Change of Rate Upon Contract

Whether the production of an article is a public service utility depends upon the duty undertaken upon behalf of and owed to the public or upon some defined portion of it, rather than the use to which the article is put, and the furnishing of electricity to the inhabitants of a city is not exempt from municipal regulation when furnished for power purposes. One of the primary objects of rate regulation is to prevent discrimination. While a public utility is bound by the prescribed rates, an individual is not unless he accepts the service or commodity, after which he cannot contest the reasonableness of the rate. Therefore an ordinance fixing the rate for furnishing electricity was held not invalid because it prevented agreements for a lower rate. An ordinance fixing the rate for furnishing electricity for a period of one year, which was passed after consumers had been given an opportunity to be heard, did not deprive a consumer of the equal protection of the law because it provided that no change should be made in the rate during the year, unless upon an application for a reduction thereof by the producer. The consumer had an opportunity to be heard, a definite time could be fixed within which the rate could not be changed, and the provision for a reduction of rate was as clearly designed for the benefit of the consumer as the producer.

A contract between a producer and consumer of electricity as to the rate will be conclusively presumed to have been entered into in contemplation of the power of the proper public authorities to fix the rates, and it was not violated by the producer's charging a higher rate which was subsequently prescribed by the municipality.

Pinney & Boyle Co. v. Los Angeles Gas & Electric Corp., California Supreme Court, 141 Pac. 620.

Substation Accident—Safe Appliances—Contributory Negligence

An employee, twenty years of age, after working nineteen days for a traction company in learning the work of a substation attendant, was told to go into the high-tension room and clean it out. He went into the room without opening the outside switches, opened the inside switches, and while cleaning out the room he appeared to have touched one of the blades of an inside switch, making a ground connection, and was injured. In an action for his injuries there was evidence that he had been instructed in the use of the two sets of switches, and that he was guilty of negligence in going into the room without first opening the outside switches. It was therefore held that an instruction which limited the care of the plaintiff to what he did while in the high-tension room was erroneous. Evidence that a different construction of the wires and switches would have been safer for the employees was held to be improperly admitted, the issue being whether the defendant used reasonable and ordinary diligence to provide reasonably safe appliances.

Moore v. Springfield & N. E. Traction Co., 180 Ill. App. 623.

Coal Company Supplying Electricity Held a Public Service Corporation

A physician, a barber, and the postmaster of a town complained of the refusal of the West Virginia Public Service Commission to order a coal company to furnish them with electricity for lighting purposes upon the usual terms upon which it supplied the commodity to other persons similarly situated. The corporation was organized under a charter authorizing only mining and sale of coal and the exercise of rights incidental to such business. Its electrical plant was installed and maintained primarily for the operation, by electrical power, of its mining machinery, and the lighting of its stores, offices, and tenement houses. It nevertheless engaged in the work of supplying from its electrical plant, electricity for lighting purposes to practically all such persons resident within the incorporated town in which its stores and offices were located as applied for such service, at uniform rates of compensation, wiring their buildings for its use, and furnishing them fixtures therefor. It was held that the company was a public service corporation, within the meaning of the West Virginia public service corporation act, chapter 150, Code of 1913 (secs. 636-656), and so much of its business as was of such public nature was subject to control and regulation by the Public Service Commission, under authority conferred by said act. Service to the petitioners was ordered upon the terms and conditions prescribed for other persons similarly situated.

Wingrove v. Public Service Commission, West Virginia Supreme Court, 81 S. E. 734.

City's Power to Erect and Maintain Light Plan

The Washington Supreme Court holds that a grant of power to provide for lighting the city authorizes the erection and maintenance of an electric plant for lighting the streets, and also supplying, in connection therewith, electric light for the inhabitants of the city in their private homes. It is also of opinion that furnishing current for lights for the people in their private homes is a public service.

Chandler v. City of Seattle, Washington Supreme Court, 141 Pac. 331.

Defective Ground Detectors—Necessity for Insulation

A city employee, employed in moth work, while climbing a tree, received a shock from a wire carrying a current of 6,600 volts, and sued the light company for his injuries. There were three of these wires strung in a row between rows of wires of a lower voltage above and below them, no extra precautions being taken in regard to the high voltage wires. The light company had no separate ground detector for the high voltage wire, and the general detector for the whole system did not show that there was any ground on the day in question. A ground such as caused the accident was of such a character that it would have been recorded if the detector had been in proper condition. This was held to warrant a finding of negligence on the ground that the detector was out of order. The necessity of men climbing trees to do the required work on moths was known, and it was possible to insulate the electric wires. They passed through or by trees at fifty places at least and were not insulated. This was held also to warrant a finding of negligence, without showing that the methods of insulation testified to by the plaintiff's experts were in use elsewhere or were not too expensive. The plaintiff was an experienced man in moth work, but not in electricity, and was not guilty of contributory negligence.

McCrea v. Beverly Gas & Electric Co., Massachusetts Supreme Court, 104 N. E. 365.

Right of Light and Power Company to Change its Current System

It is held that, under an ordinance granting an electric light and power company the right to install either "the three wire direct or the alternating system," the company after having elected to use the three wire direct current system is not entitled to change to the other system where a part of the citizens have expended large sums of money to connect with that system, which would be lost if the change were made.

City of Aledo v. Tri County Light & Power Co., 187 Ill. App. 554.

Dangerous Guy Wires in Streets—Liability of Municipality

A girl about 12 years of age slipped and fell against a guy rod erected and maintained by a light and power company, and was severely burned by reason of the rod having become charged with electricity the night before. She recovered a judgment against the light company, which became insolvent, and the judgment could not be collected. She afterwards sued the city. It was held that a municipal corporation is liable for an injury caused by a dangerous obstruction in the street which results from a disarranged or defective system of electrical wiring, maintained lawfully in the street by others than the municipal corporation itself, only where it had, or by the exercise of reasonable care would have obtained, notice of the defective and dangerous conditions which produced the injury, with reasonable opportunity to remedy the dangerous condition before the injury occurred. The corporation is not required to inspect the wiring, insulation, apparatus, and appliances of an electric light plant, operating in the city under a franchise, to discover defects therein. If, however, a municipality permits a third party to maintain in the streets a system of electrical wiring, a portion of which extends into a sidewalk, constituting an obstruction thereof, and which creates a condition so inherently dangerous as to amount to a nuisance—one that constitutes a peril and menace to persons using the streets—and it has knowledge of such condition, and of the danger, or the circumstances are such that knowledge will be implied, then it may be liable to a person injured because of such dangerous obstruction. Judgment for the plaintiff was affirmed.

City of Shawnee v. Sears, Oklahoma Supreme Court, 137 Pac. 107.

PUBLIC SERVICE COMMISSION RULINGS

Special Minimum Charge for X-Ray Machine Service

The commission holds that a special rate classification should obtain for electricity used in the operation of an X-ray machine, due to the peculiar conditions incident to its operation. It fixed a minimum charge of $3 per month in this particular case.—Butler v. Tucson Gas, Electric Light & Power Co.—*Arizona Commission.*

Conditional Authority to Issue Bonds

The Southern Sierras Power Company has been authorized to issue $300,000 of its first mortgage 6 per cent. twenty-five year bonds, on condition that the company adjust its accounts with such of its affiliated and closely associated companies as may be necessary, so as to eliminate profits made for construction work at its expense, and on condition that detailed statements be filed showing its sources of revenue and receipts for current purchased.—*California Commission.*

Extension of Wires—Protection of Exclusive Occupation

In an informal complaint for an extension of gas and electric service it appeared that in a tract of land within the city limits of Phenix there were, either in the course of construction or completed, some fourteen residences of a substantial type, and that the construction of additional houses, and the occupancy of present houses, would be delayed, if not absolutely defeated, until the service was rendered. The corporation, the Pacific Gas & Electric Company, was ordered to make the required extension. The commission was of opinion that a public service corporation occupying an exclusive field, as in this instance, should hold itself in readiness to make reasonable extensions to serve new districts, and a company which shows a disposition to comply with this principle is entitled to protection against occupancy of its field.—*California Commission.*

Notice of Disconnection

The Pacific Gas & Electric Co. had a rule providing for the mailing to delinquent customers before disconnecting service of two notices, the first on the 17th and the second on the 24th of each month. It is now allowed by the commission to substitute for this rule one requiring a single notice on or before the 20th of each month, on the ground that the expense incident to a second notice should not be incurred.—*California Commission.*

Commission's Power to Require Maintenance of Service

In ruling that a railroad company will not be allowed to close or suspend traffic on account of snow interference or snow slides alone, for any longer period than is absolutely necessary to remove the snow, the Idaho commission holds that the Idaho Public Utilities Act confers authority upon the commission to require the maintenance by any public utility of its service or facilities.—In re Oregon Short Line Railroad—*Idaho Commission.*

Authority to Reduce Minimum Rate—Discount

The City of Rensselaer, which operates an electric light plant, has been authorized to reduce its minimum lighting rate from $1 a month to 85 cents a month, with a discount of 10 cents if bills are paid on or before the 10th day of each month.—*Indiana Commission.*

Franchise Grants to Individuals—Conditions

The Iowa Commission, in Maher v. Jackson and Clinton Counties, has granted a franchise to an individual to build, construct, reconstruct, equip, maintain and operate a transmission line for the purpose of conducting electricity for light, heat and power, and in furtherance thereof the right of eminent domain. The conditions on which the franchise is granted are that the line should not interfere with the use of public highways or private lands, and that it be constructed and operated according to approved standards in order to secure safety and efficiency in operation. In particular it was provided that any crossing of the toll lines of the Iowa Telephone Company and adjoining span be constructed as provided in the specifications for overhead crossings of electric light and power lines adopted by the National Electric Light Association at its annual meeting in the year 1911.—*Iowa Commission.*

New Franchise for Period of Years

A franchise for the period of twenty-five years has been granted to the Grinnell Electric & Heating Company to build and operate a transmission line for the distribution of current for light, power, and heat between Grinnell, Poweshiek County, and Kellogg, Jasper County, Iowa, the material to be of good quality and the workmanship first-class and in accordance with the Iowa statute authorizing the franchise.—*Iowa Commission.*

Permission to Enter Occupied Territory

In a proceeding instituted by the Vinal Haven Electric Company for permission to enter the town of Vinal Haven it appeared that, while another company, the Vinal Haven Lighting Company, was authorized to supply electric service, it was, in fact, merely furnishing gas. It also appeared that the same individuals were interested in both companies as stockholders and it was the purpose of the electric company ultimately to take over the business and property of the lighting company. The lighting company filed its consent to the granting of the petition. The required permission was granted.—*Maine Commission.*

Reduced Rates to Charitable Institutions—Schools Excluded

The Rumford Falls Light and Water Company has been authorized to grant reduced rates to certain specified churches, chapels, missions, libraries, and a mechanics' institute under the provision of the public utilities act permitting reduced rates for charitable and benevolent purposes; but not to public schools, as not being charitable institutions.—*Maine Commission.*

Security Issue Limited to Value of Property

The commission holds that it cannot authorize the issuance of securities beyond the value of a public service company's property, although it appears that the company has actually expended on the plant a larger sum than it asks to capitalize. *In re* Edison Electric Illuminating Co. of Cumberland.—*Maryland Commission.*

Acquisition of Another Utilities Stock

The Columbia Mills, Inc., a corporation which generates electricity for manufacturing purposes and distributes a limited amount of current for sale across a highway under an approved franchise, made application to transfer its power plant to the Northern New York Power Company and to receive as part consideration therefor stock of the latter company to the par value of $500,000, although, ordinarily, it is the policy of the commission to authorize the acquisition of stock of an electrical corporation by a corporation primarily organized and doing business as a business corporation. The Columbia Mills was held to be an electrical corporation within the definition of that term in subdivision 13 of §2 of article I of the New York Public Service Commission Law, qualifying it under §70 to acquire and hold all the stock and bonds of any other electrical corporation.—*New York Commission, Second District.*

Approval of Sale of Plant—Effect as to Value and Rates

In an application for the sale of the property of the Millersburg Electric Light Company to the Citizens Light & Power Company it appeared that adequate service at a reasonable rate would be furnished and that the service would be approved without any increase in rates. The sale was approved. At the same time the commission held that the approval of the sale at an agreed price of the property of a public service corporation is not a finding by the commission of the value of the property, nor an acquiescence in the value placed upon the property by the companies involved, nor an approval of the consideration stipulated; nor is it an approval of the rates charged, or a finding that they are reasonable and not discriminatory—*Ohio Commission.*

Crossing Highway in Occupied Territory—Conditional Grant

The Lehigh Navigation Electric Company filed an application for the approval of an ordinance of the borough of Wind Gap granting it the right to erect high tension wires across a street in that borough for the purpose of furnishing service to a neighboring township. The crossing also involved the crossing of the facilities of the Pennsylvania Utilities Company. The commission held that a certificate of public convenience would not be denied on the theory that it would enable the applicant to furnish service in Wind Gap, to the disadvantage of the Pennsylvania Utilities Company, which was already furnishing adequate service therein. The certificate was granted on condition that it should not be construed as a grant of authority to furnish service in Wind Gap.—*Pennsylvania Commission.*

Purpose of Minimum Charges—Readiness to Serve

The Oklahoma Commission holds that in determining the justice and equity of minimum rates for electricity the expense of standing ready to serve, interest on investment, and the equipment devoted to the particular class of service which must be maintained whether any current is used or not must be considered. The commission is not prevented by a city ordinance permitting specific minimum charges from establishing lower rates, if the ordinance rates are unreasonably high. A minimum change is for the purpose of taking care of those continuous fixed charges which accrue to the plant because of the facilities devoted to the use of the particular consumer, such as meters, transformers, meter readings, collections, etc. The Oklahoma Gas & Electric Company was ordered to establish a minimum rate for power service of $1 for 1 horse power or less of connected load; 50 cents for the next 29 horse power of connected load; and 25 cents for each additional horse power of connected load.—*Oklahoma Commission.*

Rules Regarding Discount for Prompt Payment

All Pennsylvania public service companies imposing penalties for failure to pay bills promptly, or allowing discounts for prompt payment of bills, must provide in their posted and filed tariffs, a rule clearly stating the said purpose for which, and the exact circumstances and conditions under which, penalties are imposed, and discounts allowed, and in case of allowance of discounts, stating also, in clear and unambiguous terms, whether or not payments mailed, as evidenced by the post office mark, on or previous to the last day of the discount period, will be deemed by the company to be a payment of the bill within such discount period.—*Pennsylvania Commission.*

Rate Making—Value of Water Rights

Following the decision of the United States Supreme Court in San Joaquin, etc., Irr. Co. v. Stanislaus County, 233 U. S. 454, 34 Sup. 652, the Washington Commission holds that water rights should be valued, if value exists. Public Service Commission v. Pacific Light & Power Co.—*Washington Commission.*

Ownership of Meters

A petition by consumers of electric light complained, among other things, that certain electric meters were owned by consumers. Affirming In re Investigation of the Hudson Water Works, 1908, 3 W. R. C. R. 138, the Commission held that the law contemplates that the divided ownership of part of the equipment of public utilities shall cease and that both private and municipal plants must acquire, by purchase or lease, all meters used in connection with their respective works.—*Wisconsin Commission.*

Use of Commission Rulings by Public Service Companies

The Pennsylvania Commission orders that no administrative ruling, regulation or order shall, in any written or printed notice or other communication to its patrons, be stated by any public service company to have been made by the Commission, unless an exact copy of the particular ruling, regulation or order so referred to is therein set forth at length and the date thereof also stated.—*Pennsylvania Commission.*

MANUFACTURERS' NEWS

N. W. Bellmuth and M. Rosenberg, formerly associated with Shapiro & Aronson in the lighting fixture business, have resigned and organized the Brassart Fixture Co. at 13-15 Laight street, New York. This company will manufacture fixtures and fixture parts, and expects to be ready to cater to the electrical trade early in June. Henry Popkin, also formerly with Shapiro & Aronson, has associated himself with the Brassart Co., and will travel for it in the Middle West and the West.

The Gopher State Lumber Co., Plymouth Building, Minneapolis, Minn., was recently organized, with R. V. Norbeck, as manager, to deal in white-cedar poles, ties, etc. Mr. Norbeck has been identified with the cedar industry for a number of years. He was formerly with the Standard Cedar and Lumber Co., and in 1909 connected himself with the Bell Lumber Co.

The Duntley Products Sales Co., 732 South Michigan avenue, Chicago, is now acting as sole distributors of all Duntley electric vacuum cleaners.

The Coil Mfg. & Repair Co., 1011 Power avenue, Cleveland, Ohio, announces that it has taken over the business of Hersh Krueger Electrical Works, Cleveland. This consolidation gives the Coil Mfg. & Repair Co. greater facilities for taking care of armature and commutator work.

The Dey Electric Vehicle Syndicate, 45 Broadway, New York, has been merged into the Dey Electric Corporation at the same address.

The Standard Electric Novelty Co., 10 N. Desplaines street, Chicago, Ill., has recently incorporated and engaged larger space for the manufacture of its new patented Metallic flashlights. This company has recently issued a new circular describing and illustrating its new line of electric flashlights and novelties.

The Appleton Electric Co., 212-214 North Jefferson street, Chicago, Ill., has purchased from O. M. Pague all tools, dies, special machinery and patent rights for the manufacture of "Pagrip" metal molding and fittings. The Appleton Electric Co. is now the sole manufacturer of "Pagrip" metal molding and fittings and controls all patents. These fittings were illustrated and described on page 21 of the Electrical Record for May, 1915.

The Phoenix Glass Co. has moved its showrooms from 15 Murray street, New York, to the Victoria Building, 230 Fifth avenue, New York.

The Chicago Chandelier & Bronze Co. of Chicago, Ill., will succeed to the business of the retail department of the D. L. Braun Mfg. Co., the wholesale department of which was recenty taken over by the Beardslee Mfg. Co. of Chicago. The new fixture firm will be located at the corner of Wabash avenue and Washington boulevard and will be under the direction of John Ricklefs and George Kaiser.

The Railroad & Electric Supply Co. of Seattle, the Northwest distributors of the Edison storage battery, have delivered to the Puget Sound Traction, Light & Power Co. of Seattle, two hundred cells of type B-6H 120 ampere-hour Edison storage battery. They will be used to light their James and Madison street cable cars at Seattle, using ten cells arranged in two five-cell trays on each car.

The G. & W. Electric Specialty Co. has moved its factory and offices from 6308 Blackstone avenue to 7440-52 South Chicago avenue, Chicago, Ill. More floor space and better manufacturing facilities are available at the company's new location.

The Diamond State Fibre Co., of Elsmere, Delaware, has removed its Chicago factory from 619 West Jackson boulevard to 619-631 West Washington boulevard.

The Betts & Betts Corporation, 256 West 55th street, New York, has been awarded contracts to install electric clock systems in the Earl Gray School at Winnipeg, Manitoba; the Grant School at Westfield, N. J., and the Palmyra High School at Palmyra, N. Y.

The Peerless Rubber Mfg. Co. has moved from 16 Warren street, New York, to larger quarters at 31 Warren street.

At a recent annual meeting of the Joseph Dixon Crucible Co., Jersey City, N. J., the following officers were elected: President, George T. Smith; vice-president, George E. Long; treasurer, J. H. Schermerhorn; secretary, Harry Dailey; assistant secretary and assistant treasurer, Albert Norris.

The Bodine Electric Co. has moved its factory, offices and salesrooms from 564 West Randolph street, Chicago, to Oakley boulevard and Ohio street, Chicago.

The installation of nine 2500-kilowatt, 60-cycle, rotary converters at the Little Tennessee plant of the Aluminum Company of America at Maryville, Tenn., in addition to constituting one of the largest 60-cycle rotary converter installations in the world, presents a number of interesting features in the arrangement of the controlling and protective equipment. Energy is brought to the station by the Tennessee Power Co. over a single-circuit transmission line 70 miles in length, consisting of 400,000 circular mil stranded aluminum cables, is carried on steel towers 55 feet in height, the lines being hung from suspension insulators. Temporarily a transmission voltage of 60,000 is used, which later will be boosted to use 110,000 volts. The complete electrical equipment for this station was manufactured by the Westinghouse Electric & Mfg. Co.

All of the interior furniture including wardrobes, berths, dining tables, chiffoniers, bureaus, toilet cases, as well as the book cases, desks and other office supplies on the new U. S. superdreadnaught, *Pennsylvania*, will be of art metal, supplied by the Art Metal Construction Co., of Jamestown, N. Y. The installation of this kind of furniture is not in the nature of an experiment, as several of the other new ships have been so equipped.

It is reported that the Westinghouse Electric & Mfg. Co. has bought the plants of the J. Stevens Arm & Tool Company at Chicopee Falls, Mass., and East Springfield, Mass. Work will be rushed, it is said, on a large order for arms from one of the belligerent countries. After the war is over the factories will be used for the manufacture of electrical products. It is announced that W. L. Clark, formerly vice-president of the Niles-Bement-Pond Co., will be made manager of the two plants.

"White Cedar Poles as We Find Them" is the title of an illustrated pamphlet recently issued by The Macgillis & Gibbs Co., 1302 Wells Building, Milwaukee, Wis.

Chas. H. Latimer, secretary and treasurer of the American Enameled Magnet Wire Co., Muskegon, Mich., reports that on account of increased business the company has been obliged to enlarge its factory. This company is now occupying the entire building and is employing more hands at full time.

The Westinghouse Electric & Mfg. Co. reports the recent receipt of numerous orders from various parts of the country for generators, converters, motors, transformers, and switchboard apparatus. Among these orders are several for motors and switchboard and control equipment from the sugar mills in Cuba.

The Alter Light Co., 827 S. Loomis street, Chicago, Ill., announce that owing to disturbed conditions in the brass market, it has been compelled to make an advance of from 10 to 20 per cent. in the price of its products. All former quotations are withdrawn.

The Illuminating Electric Mfg. Co., 236 South 3rd street, Philadelphia, Pa., has reduced the price of its Daylite lantern. These lanterns are now sold for $1.50 and $2.00 instead of $2.00 and $2.50. This reduction in price is due, we are informed, to the large increase in sales resulting from advertisements appearing in the ELECTRICAL RECORD.

More than 150 were present at the annual dinner and smoker of the Century Engineering Club, an organization of the employees of the Century Electric Co., St. Louis, Mo., manufacturers of "Century" single phase motors and fans, which was held in the banquet room of the American Annex Jovian Hotel, May 4, 1915. The officers and directors of the company were guests of honor. The organization during the past year has directed its efforts along educational and co-operative lines. The officers of the club are: J. M. Chandlee, president; E. A. Ross, secretary; J. L. Woodress, chairman program committee; and J. Kramer, chairman entertainment committee.

The directors of the Westinghouse Electric & Mfg. Co. voted at a special meeting May 5 to alter the prevailing provisions for the conversion of convertible bonds into stock. The conversion price of 200 will, under the plan, be reduced to 100 for the rest of the year, and thereafter will be 110. Bondholders will be asked to consent to a change in the trust indenture under which the bonds were issued in return for the more favorable terms of conversion proposed. In case the plan becomes operative, either common stock of the company to the amount required for conversion under the plan or new bonds convertible into common stock at the reduced price will be offered to shareholders for pro rata subscription at 105. To the extent that stock or bonds are sold upon this basis the proceeds will be used to retire the present bonds at the redemption price. There are $19,476,000 5 per cent. convertibles outstanding. The plan provides that new bonds may be exchanged for the old at par. Also, bonds presented for payment in cash will be paid off at 105, while the exchange may be made part for cash and part for new bonds.

Sixty-five different kinds and finishes of flashlights and lanterns, together with a full line of "Kwik-lite" batteries and mazda flashlight lamps, are fully described in a new thirty-two page catalogue recently issued by the Usona Mfg. Co., Inc., 1 Hudson street, New York, and 307 S. St. Clair street, Toledo, Ohio.

BRANCH OFFICES AND AGENCIES

Do you want an agent. If so, we will put the notice here free. The same privilege is extended to agents desiring to represent manufacturers.

On page 202 our readers will find an advertising section, giving the local address and telephone number of manufacturers' agents and branch offices of out of town concerns. The constant inquiries coming to the ELECTRICAL RECORD for this information caused this section to be started. It will be found especially useful by persons wanting immediate information. As a time saver it will be appreciated.

Owen T. Snyder & Co., Columbus, Ohio, are looking for agents to handle their new safety switch. Correspondence should be addressed direct to the company.

Bremer & Lang, 59 Hancock avenue, Jersey City, N. J., are looking for agents to handle their new "Uneeda" fuse tester. This instrument is described in the New Products department of this issue.

Walker Brothers & Haviland, general sales representatives in Chicago for the Industrial Controller Co. of Milwaukee, Wis., and also selling agent for the

Monarch synchronized time system, have moved their offices from 955 Monadnock Block to 1821 People's Gas Building, Chicago.

Light & Power Supplies, Inc., 366 Fifth avenue, New York, have an active sales force and are open for the New York agency for engineering supplies of steam, electrical or refrigerating plants.

The Rale Electrical Supply Co. has been organized to carry on an electrical supply and manufacturers' agency business at 93 West Seventh street, St. Paul, Minn. Samuel J. Rale, the proprietor, was formerly a member of the firm of Rale & Weber Co., 558 Melrose avenue, Borough of the Bronx, New York City.

The Corliss Carbon Co., of Bradford, Pa., manufacturer of motor and generator brushes, has removed its New York office from 30 Church street to 114 Liberty street.

The General Lead Batteries Co., of Newark, N. J., announces the removal of its Chicago office from 2332 Michigan avenue to 219 East 24th street.

The C. & C. Electric & Mfg. Co., of Garwood, N. J., manufacturers of C. & C. motors, generators, and electric arc welders, announces the removal of its Chicago office to 911 First National Bank Building.

The Adams-Bagnall Electric Co., Cleveland, Ohio, has moved its New York office from 40 Wall street to 30 Church street, and its Chicago office from 417 South Dearborn street to the Fisher building.

Pass & Seymour, Inc., of Syracuse, N. Y., have removed their New York office from 178 Fulton street to 6 Church street.

The General Lead Batteries Co., Newark, N. J., has moved its Chicago office from 2332 Michigan avenue to 219 East Twenty-fourth street.

The National Conduit & Cable Co., 41 Park row, New York, has moved its Chicago office from 736 Rookery Building to 72 West Adams street.

The Jefferson Glass Co., Follansbee, W. Va., announces the opening of an office and sample room in San Francisco, located in the Rialto Building. Edwin B. Pike will be in charge.

The Adams-Bagnall Electric Co., Cleveland, Ohio, announces the opening of a branch office at 1434-35 Syndicate Building, St. Louis, Mo. This office will be in charge of H. E. Merrithew.

The Walter P. Ambos Co. of 1729 East 12th street, Cleveland, Ohio, has taken over the line of the Eastern Flexible Conduit Co. of Brooklyn, N. Y., and will act as the Cleveland office of the conduit company.

The King Electric & Mfg. Co., Cleveland, Ohio, manufacturers of low-voltage transformers, announces that S. R. Schwartz & Bro., 622 Broadway, New York, and M. V. Simpson, 330 Union League Bldg., Los Angeles, Cal., will act as selling agents in their respective terrritories. Both concerns will carry stock.

The Union Electric Co., Pittsburgh Terminal Warehouses, Pittsburgh, Pa., has made an arrangement with the American Ever Ready Works of the National Carbon Co., to handle its non-sulphating storage batteries in the Pittsburgh district. A new service station will soon be started at 418 Wood street, Pittsburgh.

JOBBERS AND DEALERS

The Protective Electric Supply Co., of Fort Wayne, Ind., has moved to larger quarters and will use the entire six stories and basement of its new quarters for stock and show rooms for electrical supplies and fixtures. The rear of the building is located on a side track, and all goods will be loaded and unloaded directly on and off of cars. This company has recently added W. A. Gierring to its sales force. Mr. Gierring was formerly connected with the E. W. Marshall Co. of Detroit.

Edwin C. Lewis, Inc., 121 Federal street, Boston, Mass., notifies the trade that John B. Ward and T. J. O'Brien have become associated with that concern.

William A. Re Qua has opened an electrical supply store in the new building at 114 St. Paul street, Rochester, N. Y. He will carry a complete line of standard electrical materials and fittings. Mr. Re Qua has been connected with the electrical industry for the last 16 years. He traveled New York state for the Western Electric Co. for 8 years, and is therefore well known among the dealers and contractors.

The Philadelphia Electric Co. Supply Department, 132 South 11th street, Philadelphia, Pa., report an improvement in the general tone of business, especially in orders from central station customers who are making use of many of its specialties. The company's reverse phase relay is said to be in great demand by large central stations for use on polyphase motor-driven elevators and cranes.

R. E. Patterson, who has been engaged in the electrical business for the last ten years at Sandusky, Ohio, has started an electrical supply anad repair shop at Milan, Ohio. He will carry a full line of electrical supplies and an Edison storage battery equipment for demonstration purposes. He wishes catalogues from manufacturers of current consuming devices, especially direct current devices operating at a pressure of 32 volts. He also requests catalogues from gas engine manufacturers.

The Western Electric distributing house in Kansas City is now located in new quarters at 608-610 Wyandotte street, opposite the old building which served as its headquarters for the past ten years. The new building is five stories in height with cellar and subcellar all completely equipped with sprinkler system. It has a frontage of 50 and a depth of 175 feet affording about

52,000 square feet of floor space. Switch track facilities have been so arranged that freight cars can be spotted without interfering with either the shipping court, store, or offices.

Catalogue number 200 now being distributed by the Wesco Supply Co., 7th to 8th streets and Clark avenue, St. Louis, Mo., is a complete and up-to-date reference book of standard electrical supplies. It illustrates and describes material for which there is a daily demand. The book contains 1280 pages, 50 of which are given over to a comprehensive index. The supplies are grouped, and reference to the class of goods upon which information is desired is readily obtainable by means of a useful and time-saving visible marginal thumb index.

PERSONAL

H. S. Collette, secretary of J. G. White & Company, Inc., and The J. G. White Engineering Corporation, has resigned from these companies, and expects to reside permanently in California.

James W. White, who was for years connected with the Union Switch & Signal Co., has joined the sales force of the Electric Cable Co., of 17 Battery place, New York.

The Civic Forum medal of honor for distinguished public service was presented to Thomas A. Edison at the final meeting of the season of the Forum on May 6, at Carnegie Hall, New York. The list of speakers included Messrs. Marconi, Steinmetz, and Coffin.

E. St. E. Lewis, vice-president and general manager of the Art Metal Construction Co., of Jamestown, N. Y., has been elected president of the Jamestown Board of Commerce. Mr. Lewis has had a large experience in executive work. He was one of the organizers and first president of the Association of National Advertisers. He was one of the organizers and first vice-president for two years, of the National Association of Corporation Schools, which has for its object the development of industrial and vocational education among the large plants of the United States and Canada.

Robert C. Fenner, who for the past nine years has been connected with The Cutler-Hammer Mfg. Co., of Milwaukee, has resigned as manager of the Chicago office of that company and has opened an office of his own in the People's Gas Building, Chicago, where he is acting as manager of sales for a number of mechanical and electrical specialties. Mr. Fenner is well known in electrical circles in the East, having been for three years manager of the Boston office of The Cutler-Hammer Co. Prior to that he was an instructor in Physics at Cornell. Mr. Fenner has taken an active part in the work of the Chicago Association of Commerce, being chairman of the electrical sub-division of that association and a member of the Ways and Means Council.

OBITUARY

Gerrit Smith, inventor of quadruplex telegraphy, died at Amityville, Long Island, N. Y., May 4, following a month's illness. Mr. Smith was for fifty-four years in the employ of the Western Union Telegraph Company and retired on a pension ten years ago.

Ernest A. Poole, manager of James W. Poole, Inc., 16 Columbia street, Boston, Mass., died at his home in Boston on May 12.

C. R. Smith, assistant general manager of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., died recently as a result of an attack of heart trouble. Mr. Smith entered the employ of the Westinghouse company 10 years ago, and has held various important posts with that concern since then, being appointed to the assistant general managership three years ago.

William H. Bancroft, who had been until February of this year, president of the Utah Light & Railway Company, died on April 23, death resulting from a stroke of apoplexy. About a year ago he retired as vice-president and general manager of the Oregon Short Line Railroad Co., a position which he had held for twenty-three years. When the late E. H. Harriman acquired control of the Utah Light & Railway Company about eight years ago, Mr. Bancroft was assigned to the responsible position of president of the company. Upon him devolved the important work of rehabilitating the street railway and lighting and power system of Salt Lake City. He overhauled the entire system, made it one of the best equipped electric railways in the West, and turned an annual deficit into dividends.

ASSOCIATIONS AND SOCIETIES

The board of nominations of the Illuminating Engineering Society announces the following candidates for officers of the society for 1915-1916: president, C. P. Steinmetz; vice-presidents Clarence L. Law and J. L. Minick; secretary, Alten S. Miller; treasurer, L. B. Marks; directors, W. A. Durgin, M. Luckiesh, J. A. Norcross. Several amendments to the society constitution are also proposed. The chief amendment divides the present individual membership into two grades: associate members, paying annual dues of $5, and members paying $10. The rights and privileges of both classes are to be identical except that members only shall be eligible as officers of the society.

The 1915 convention of the Michigan Electric Light Association, which is now a state section of the National Electric Light Association, will be held on board the steamship Rochester during a cruise on Lakes Huron, Superior and Michigan, June 26 to 30. The vessel will leave Detroit at 1 p. m. Saturday, June 26, and proceed up Lake Huron to Sault Ste. Marie, passing through the locks into Lake Superior about midnight Sunday. Monday morning will be spent in cruising along the north shore of the lake, returning to the "Soo" at noon and reaching Mackinac Island Monday night. Tuesday will be occupied with the passage down Green Bay, entering Lake Michigan at noon through the Sturgeon Bay ship canal. The party will disembark in Lake Kalamazoo next day, making a total trip of 1,000 miles. The fare for the cruise will be $27.50. Herbert Silvester, Detroit Edison Company, Detroit, Mich., is secretary of the section.

The Oklahoma Electric Street Railway Association held its annual convention at Oklahoma on May 12-14, 1915.

A. S. Langsdorf, dean of the School of Engineering of Washington University, St. Louis, Mo., was the speaker at a meeting of the St. Louis Jovian League of Electrical Interests, held at St. Louis on May 18. Mr. Langsdorf's subject was "Raising the Educational Load Factor."

On May 19 the New York Jovian League had a luncheon meeting at the Hotel Martinique, New York, at which A. G. Kingman of the Western Electric Co. gave an illustrated talk on "The Great Pacific Coast Expositions." What the League calls "Three Minute Get Acquainted Talks" were conducted by Walter Stockberger of the Banner Electric Lamp Co., H. J. Issertell of the General Electric Co., J. J. Sheeran of the R. B. Corey Co.

The twelfth annual outing and games of the Electrical Bowling Club is to be held this year on July 17, and is to be again at Midland Park, Grant City, Staten Island. The arrangements for this year's outing are to be the same as for previous outings. The tariff for the afternoon and evening's enjoyment, including refreshments in the way of a shore dinner and extras, is $2.50 a person. It is announced that the baseball game of last year between the inside electrical men and outside electrical men having been protested on account of a disputed decision given in the ninth inning, will be played off this year. Game called at 2.30. Tickets for this outing can be obtained from C. E. Merrill of the Manhattan Electrical Supply Co., 17 Park place, New York.

Employees of the New York & Queens Electric Light & Power Co. have formed the Watt-Hour Club. Frank E. Andrews, of Flushing, N. Y., is president; E. J. Murphy is secretary-treasurer. At the organization meeting of the club C. A. Barton, general sales agent, addressed the members on the subject of co-operation between contractors and company.

"Japan's Demands on China and Its Relation to American Commerce," was the subject of an address given before the Jovian Electrical League of Philadelphia on May 6, by Paak Tong Lau.

A meeting of the council of the Illuminating Engineering Society was held at 29 West 39th street, New York, on May 13. In reporting for the committee on popular lectures, C. E. Clewell said that the manuscripts of the first two lectures on store and residence lighting respectively would be submitted shortly for approval of the council. The committee has in the course of preparation five popular lectures on industrial, store, office and residence lighting, and one on the fundamentals of light and illumination. It is intended that these lectures will present in simple and attractive form the elementary principles involved. Copies of each lecture, together with suitable lantern slides, will be available for loan to those who desire to give popular talks on lighting.

Among the papers read at the convention of the Southwestern Electrical & Gas Association, at Galveston, Texas, on May 19-22, were the following: "Economies in Repairshop Work and Maintenance," V. W. Berry; "An Absolutely New Type of Street Car for City Operation," C. O. Birney; "A Study of the 'Jitney,' " R. T. Sullivan; "The Commercialization of Central Station Organizations," Hartwell Jalonick; "What the Southwestern Electrical and Gas Association Can Do For Me," A. V. Wainwright.

The Ohio State Electrical Contractors' Association held its annual convention at Cincinnati, Ohio, May 12-13, 1915. The business sessions of the convention were held on May 12; May 13 was devoted to sightseeing, a shore dinner, and a boat trip down the river to the Government Dam at Fernbank.

The Vulcan degree, or Degree of Industry, is a new advanced degree in The Jovian Order conferred from year to year upon Jovians in good standing who are particularly interested in the development of the electrical industry by commercial co-operation on an extensive scale, through the instrumentality of The Jovian Order —Commercial Division. This degree was created by an act of Thirteenth congress and past jupiters in joint session at which were present six past jupiters, reigning jupiter, and nine congressemn, in Chicago, on March 18, 1915. The Vulcan degree is conferred without ritual or ceremony by written notification sent to those Jovians who have accepted an invitation to receive it.

Friday, May 21, was set aside as Jovian Day at the recent convention of the Southwestern Gas and Electric Association at Galveston.

J. M. Wakeman, general manager of the Society for Electrical Development, gave an address on "Electrical Prosperity Week," at a meeting of the New York Electrical Society at 29 West 39th street, on May 19. H. W. Alexander, director of publicity for the society, gave an illustrated lecture, showing in picture form the tentative plans for that week.

The Twentieth Annual Convention of the National Association of Manufacturers was held in the Waldorf-Astoria Hotel, New York, May 25 and 26. Prominent manufacturers from all parts of the United States assembled to discuss the effects of the year's political and economic developments, internal and international, on their business. William Howard Taft, former President of the United States; Senator Warren G. Harding, of Ohio, and other speakers of national reputation addressed the convention.

The 309th meeting of the American Institute of Electrical Engineers was held in the auditorium of the Engineering Societies Building, 29 West 39th street, New York, on Tuesday evening, May 18. This was the regular annual business meeting of the Institute. The board of directors presented its report for the fiscal year ending April 30, 1915. The committee of tellers presented its report on the result of the election of officers for the coming administrative year. This report showed the following men elected: president, J. J. Carty; vice-presidents, William McClellan, Comfort A. Adams, and J. F. Stevens; managers, C. E. Skinner, John Taylor, F. B. Jewett, and Harold Pender; treasurer, G. A. Hamilton.

Following the business meeting, the Edison medal was presented to Alexander Graham Bell, the presentation address being made by John J. Carty, chief engineer of the American Telephone and Telegraph Co.

An address on "How Bell Invented the Telephone" was given by Thomas A. Watson, who was associated with Dr. Bell in the early development of the telephone.

The annual convention of the Ohio Electric Light Association will be held at Cedar Point, Ohio, July 20 to 24 inclusive.

The Electrical Manufacturers' Club held its spring meeting at Hot Springs, Va., May 5-8. Walter Cary, of the Westinghouse Lamp Co., presided. H. B. Crouse, of the Crouse-Hinds Co., Syracuse, N. Y., gave an address on "The Relations Between the Manufacturer and the Distributer."

Experiments recently made in the laboratory of one of the Canadian colleges, indicate that cobalt, heretofore distinguished as being the sprite of the metallic elements, will shortly be domesticated. The experimenters report that under proper conditions this metal responds readily to the electroplating process. It produces a coating which is harder, has greater tenacity, and is more pleasing to the eye than nickel. When used for electroplating purposes, it is said that the difference in cost between cobalt and nickel is more than offset by the far more favorable characteristics of cobalt in the way of endurance, non-peeling nature, and artistic finish.

ELECTRICAL DEVELOPMENT SOCIETY

The annual meeting of the Society for Electrical Development, Inc., was held at the United Engineering Societies Building, New York, on May 11. Henry L. Doherty presided. The following men were unanimously re-elected directors of the society for the ensuing four years: For director to represent central station interests, J. F. Gilchrist; for director to represent manufacturing interests, W. A. Layman; for director to represent contracting interests, J. R. Strong; for director to represent jobbing interests, F. S. Price; for director-at-large, Charles W. Price. The board of directors approved of the plans for Electrical Prosperity Week. A great deal of work has already been done in connection with this movement, and a great deal of publicity in the technical trade and daily press has been given to it. Electrical Prosperity Week will be held November 29 to December 4, inclusive, this year, the underlying idea being to arouse the interest of the public in the uses of electricity and at the same time, through the campaign connected with it, to bring about a more optimistic feeling throughout the country, and to give the men connected with the electrical industry the honor of leading in a movement which is intended to dispel the hard-time bogie.

FOREIGN TRADE OPPORTUNITIES

The Bureau of Foreign and Domestic Commerce maintains branch offices in eight commercial centers, where business men may more readily avail themselves of the service of the Bureau. Reserved addresses in connection with "Foreign trade opportunities" and all lists of names offered in connection with articles published in Commerce Reports may be obtained from the nearest office by application in letter form. The list of offices follow: New York, 409 United States Customhouse; Chicago, 629 Federal Building; New Orleans, 1020 Hibernia Bank Building; San Francisco, 410 United States Customhouse; Atlanta, 52 Post Office Building; Seattle, 922 Alaska Building; Boston, 752 Oliver Building; St. Louis, 402 Third National Bank Building.

No. 16619. MINING AND ELECTRICAL MACHINERY.—The Department of Commerce is in receipt of a letter from a foreign commission merchant, who is now in the United States, stating that he desires to secure agencies for the sale of mining, mechanical, and electrical machinery and instruments. He states that he desires exclusive agencies for Netherlands and its colonies. He states that he has been dealing with his Government for 17 years. Foreign and American references are given.

No. 16617. ELECTRICAL GOODS.—An American consular officer in Spain reports that a business man in his district desires to represent American manufacturers of electrical goods. Correspondence and literature should be in Spanish.

No. 16555. ELECTRICAL SUPPLIES.—An American consular officer in China transmits a report relative to an opportunity for the sale of electrical supplies. A pamphlet relative to this opportunity may be examined at the Bureau of Foreign and Domestic Commerce or its branch offices.

No. 16493. ELECTRIC LAMPS, TYPEWRITERS, ETC.—A commercial organization in Russia informs an American consular officer that it desires to represent American manufacturers of electric lamps, steam engines, motion-picture machines and films, typewriters, knitting machines, etc. Correspondence should be conducted in Russian or German. Prices should be quoted c. i. f. Russian ports. Weights, measurements, etc., should be stated in Russian equivalents.

No. 16531. WIRE FOR ELECTRICAL FOOT WARMERS.—One of the foreign legations in Washington informs the Bureau of Foreign and Domestic Commerce that a manufacturer of electrical foot warmers is in the market for the necessary wire. He needs fine nikeline, excelsior, and chrome-nickel wire of great electrical resistance, sizes 0.05 to 3 mm. Samples should be supplied. A pamphlet illustrating foot warmers may be seen at the Bureau of Foreign and Domestic Commerce and its branch offices.

Owing to the closing of some of its usual sources of supply by the war Portugal is in the market for electrical goods of all descriptions. Heretofore American manufacturers have not been able to compete with those of other countries because of the much higher prices they quoted and also because they have been unwilling to supply the quality of equipment desired by the dealers in this country; but local stocks are being rapidly depleted, and the time seems favorable for the introduction of American goods. The matter is of more than temporary importance, and if the market is properly served future development is well worth consideration. Accurate figures of the annual importation of electrical material into Portugal are not obtainable; however, a careful estimate places the total at $2,000,000.

No. 16517. ELECTRIC HEATING AND COOKING APPARATUS.—A manufacturer in Switzerland informs an American consular officer that he desires to communicate with American manufacturers of electrical heating and cooking apparatus and electrical soldering devices. Catalogues, price lists, etc., should be sent at once. Quotations should be made f. o. b. New York.

No. 16545. ELECTRIC SWITCHES.—The commercial agent of the Bureau of Foreign and Domestic Commerce in New York City has transmitted an electric switch and a detailed report relative thereto. A firm in New York City desires to purchase these switches with a view to exporting them to Australia. A detailed report may be had on application, and the switch may be examined at the Bureau of Foreign and Domestic Commerce or its branch offices.

No. 16693. ELECTRIC FIXTURES, STOVES, ETC.—A firm in Russia, which has already placed orders in the United States for electric lamps, informs an American consular officer that it desires to receive catalogues and price lists from American manufacturers of electric chandeliers, brackets, wall fixtures, and table lamps; electric appliances such as heaters, sadirons, chafing dishes, boilers, hair curlers, cigarette lighters, and novelties; electric wires; petroleum stoves for heating, petroleum ranges and small petroleum and alcohol cooking stoves. Correspondence should be conducted in Russian or French. References are given.

No. 16816. Wire and Cables.—A firm in the United States informs the Bureau of Foreign and Domestic Commerce that its London office has cabled the name and address of a firm in England which desires to secure an agency for the sale of American wire and cables.

No. 16458. SEARCHLIGHTS.—An American consular officer in one of the neutral European countries writes that a firm in his district desires to receive offers from American manufacturers who are in a position to deliver electric searchlights for military purposes.

No. 16754. RESISTANCE WIRES, ETC.—An American consular officer in Switzerland reports that an agent in his district desires to communicate with American manufacturers and exporters of resistance wires or coils and resistance straps or strips to be used in the manufacture of electrical transformers and other electrical machinery.

No. 16776. LAMP AND ELECTRIC LIGHT SHADES.—A New York exporter has received an inquiry from an English firm requesting quotations, etc., on enameled iron shades 6 to 18 inches in diameter; also for white and white and green opal glass shades 6 to 18 inches in diameter. Quotations are desired for large quantities. It is stated that payment will be made in New York City.

No. 16777. MACHINERY AND ELECTRICAL GOODS.—A European mechanical and electrical engineer, who is now in the United States, desires to form commercial relations with manufacturers of machinery and electrical goods with a view to representing them in European countries. New York City reference is given.

No. 16639. ELECTRICAL SUPPLIES.—An American consular officer in Portugal transmits a report relative to an opportunity for the sale of electrical supplies. Electrical cartridge fuses may be examined at the Bureau of Foreign and Domestic Commerce and its branch offices.

No. 16654. ELECTRICAL SUPPLIES.—An American consular officer in Italy reports that a business man in his district is desirous of communicating with American manufacturers of electrical wire, switches, bulbs, etc.

No. 16790. ELECTRICAL GOODS, COPPER, IRON, AND STEEL, ETC.—An American consular officer in Spain reports that a business man in his district desires to establish a commission business for the purpose of handling American-made machinery, electrical goods, copper, iron, and steel manufactures, parts for the construction of wagons and street cars, lubricating oils, disinfectants, etc. It is stated that this man has been connected with a well-known Spanish import firm for a number of years, but is now desirous of taking up the business for himself. Bank references are given.

No. 16821. ELECTRIC LAMPS, METERS, ETC.—An American consular officer in Russia transmits the name of a commission merchant in his district who desires to establish commercial relations with American manufacturers and exporters of electric lamps, meters, etc.; centrifugal and electric pumps; water-closet connections and supplies, etc. Correspondence may be conducted in English. Weights, etc., should be stated in Russian equivalents and quotations should be c. i. f. Russian ports.

No. 16818. ELECTRICAL SUPPLIES ETC.—An Amercan consular officer in Russia transmits the name of a business man in his district who desires to form commercial relations with American manufacturers and exporters of electrical supplies, such as bulbs, chandeliers, wiring, etc. Quotations and descriptive matter should be sent at once.

No. 16744. ELECTRICAL GOODS, FOOD PRODUCTS, ETC.—An American consular officer in Spain reports that a business man in his district desires to represent American manufacturers and exporters of knitted goods, paints, electrical goods, dried fruits, canned fish, prepared fruits, rubber tires, carbon paper, hardware, and general paper lines. References are given. Correspondence should be conducted in Spanish.

No. 16741. ELECTRICAL GOODS.—A business man in Spain informs an American consular officer that he wishes to represent American firms which may care to sell electrical goods in that country. He states that he will also buy direct. Catalogues and corresponence should be in the Spanish language. References are given.

INQUIRIES

Inquiries which we have been unable to answer have been received for the names and addresses of manufacturers of the articles listed below.

Replies from our readers to any or all of these are cordially welcomed both for publication here, and for incorporation as well in our Classified Index of Manufacturers.

In the interests of the good services which this department is expected to render, we would impress upon correspondents the advisability of making their inquiries as specific as possible. This will help materially in obtaining the desired information.

"ABC" National auto horn.
"New Easy" gas burner.
"Eddy" telephone receiver cord.
"Peerless" expansion bolt.
"Red-y" wire solder.
"Franklin" arc lamp.
"Vita" electric cooking apparatus.
"No Kair" electric stove.
"Zwicke" insulated wire.
"Bohler" magneto.
"Parmot" moulding.
"Severn" gasoline engine.
Address of Try Fireless Cooker Co.
"Eureka" porcelain knob.
"Radio" electric hair waver.
"Utility" lantern.
"Rohne" electric heating pad.
"Emco" gauge tester.
"Bedell" sad iron.
"Tugan" resistance wire.
"Vaco-Lite" flashlight lantern.
"Milford" moving picture machine.

CONSULTING ENGINEERS

Frank Hill Smith, of Dayton, Ohio, reports the following work under construction for which he is retained as consulting electrical engineer: Elwood Myers Co., Springfield, Ohio, the installation being made by the Hawkins Electric Co., of Springfield; Miami Hotel, Dayton, Ohio; James A. Banister Co., new factory at Newark, N. J.

During the annual convention of the National Association of Hosiery and Underwear Manufacturers, held in Philadelphia on May 1, an address was delivered by C. M. Ripley, a consulting electrical engineer of New York, on isolated plant service.

Announcement is made of the consolidation of the practices of John S. Griggs, Jr., electrical and mechanical engineer, and David Moffat Myers, mechanical engineer, with offices at 110 West 40th street, New York. Mr. Griggs was for twelve year senior partner of the consulting firm of Griggs & Holbrook of this city, and has been in practice as a consulting engineer in New York for twenty years. Mr. Myers was formerly mechanical engineer for the United States Leather Co., in charge of the efficiency work in their steam plants. In 1906 he started a private consulting practice and has now moved from his old office at 17 Battery place to the present address.

NAVY DEPARTMENT BIDS WANTED

The Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will open bids in the city of Washington on the date specified for the electrical supplies listed below.

Those who wish to submit bids should fill in the special application blanks, which are furnished by the Bureau on request, and should fill in these blanks with the numbers given in the "Sch." column in the list below on which they want to bid.

After having been properly filled out, these blanks should be mailed to the Bureau without delay.

The specifications will then be forwarded, or as soon as they are received from the Public Printer.

These specifications, or schedules, as they are officially called, may be obtained also by applying in the same way to the Navy Pay Office nearest each of the Navy Yards mentioned.

OPENING JUNE 8, 1915

Article.	Quantity.	Delivery at navy yard.	Sch.
Cable, interior communication	1,800 feet	Brooklyn, N. Y.	8347
Cleaner, vacuum, portable, and couplings	1 cleaner 48 couplings	Norfolk, Va.	8315
Drills, radial, portable, and bench grinders, electric	11 drills 10 grinders	Brooklyn, N. Y.	8319
Ironer, combination, motor driven	1	Philadelphia, Pa.	8320
Wire, double conductor	310,000 feet	Brooklyn, N. Y.	8347
Wire, lighting and power	7,500 feet	do	8345
Wire, rubber covered, single stranded	8,500 feet	do	8345
Wire, single conductor	51,000 feet	do	8345 8347
Wire, telephone	20,000 feet	do	8345
Wire, twin conductor	Miscellaneous	do	8347
Wire, weatherproof	do	do	8345

NEW CATALOGUES

Oshkosh Mfg. Co., Oshkosh, Wis.
Catalogue No. 35. Construction tools for telegraph, telephone and railroad lines, 32 pages.

United Manufacturing Co., Kansas City, Mo.
Bulletin No. 10. Floor machine, 12 pages.
Bulletin No. 11. Portable power plant, 12 pages.

Interstate Electric Novelty Co., New York.
Booklet. Electric flashlight novelties, 24 pages.

Robbins & Myers Co., Springfield, Ohio.
Bulletin No. 125. Type C direct current motors, 8 pages.

Usona Manufacturing Co., Inc., New York.
Booklet. Flashlights, hand lanterns, and novelties, 32 pages.

National Metal Molding Co., Pittsburgh, Pa.
Bulletin No. 250. Outlet boxes and covers.

General Electric Co., Schenectady, N. Y.
Leaflet. Electric household appliances, 8 pages.
Bulletin No. 43900. Series mercury arc rectifier outfit-combined unit, 12 pages.
Bulletin No. 48904. Electric arc welding, 12 pages.
Bulletin No. 48905. Arc welding apparatus, 8 pages.

L. B. Jones Co., Kansas City, Mo.
Sales Talks. Lighting plants, 13 pages.

James G. Biddle, Philadelphia, Pa.
Bulletin No. 800. Curnon steam meter, 4 pages.

Standard Underground Cable Co., Pittsburgh, Pa.
Booklet. 33 years of progress, 16 pages.
Bulletin No. 201-1. Standard colonial copper clad wire, 4 pages.

Thompson Electric Co., Cleveland, Ohio.
Leaflet. Safety cut-out hangers.

Adams Bagnall Electric Co., Cleveland, Ohio.
Catalogue No. 138. Abolites for series street lighting, 16 pages.

Motion Picture Fire Prevention Devices Co., Chicago, Ill.
Folder. Frude film circuit closer.

Thordarson Electric Mfg. Co., Chicago, Ill.
Bulletin No. 106. Transformers.

Pittsburgh Reflector and Illuminating Co., Pittsburgh, Pa.
Folder. Show window reflectors for Type C lamps.

Trumbull Electric Mfg. Co., Plainville, Conn.
Folder. Snap switches.

Harvey Hubbell, Inc., Bridgeport, Conn.
Folder. Shade holders.

Edwards and Co., New York.
Folder. Table clamp.

General Electric Co., Schenectady, N. Y.
Annual Report. 23rd Annual Report for 1914.

National X-Ray Reflector Co., Chicago, Ill.
Weekly sales letter. Sales news and suggestions.
Catalogue pages. Lighting fixtures and lamps.

Burchwell Manufacturing Co., St. Louis, Mo.
Catalogue. Bright Eye electric lanterns, 14 pages.

Electro Importing Co., New York.
Catalogue No. 15. Experimental apparatus and wireless supplies, 268 pages.

Sterling Foundry & Machine Co., Newark, N. J.
Bulletin No. 11. Loom box, 4 pages.

Matthews Boat Co., Port Clinton, Ohio.
Booklet. Automatic lighting and power plants, 12 pages.

Betts and Betts Corporation, New York.
Bulletin No. 97. Yerkes playing electric bells and chimes.

Benjamin Electric Mfg. Co., Chicago, Ill.
Booklet. Automobile devices, 16 pages.

Eck Dynamo and Motor Co., Belleville, N. J.
Bulletin No. 1,000. Type D commutating pole, constant speed d.c. motors, 8 pages.

Okey Manufacturing Co., Columbus, Ohio.
Bulletin No. f-6-1915. Electric generating plants for light and power, 16 pages.

Cutter Co., Philadelphia, Pa.
Booklet. Shallow flush push button wall switches, 16 pages.

G & W Electric Specialty Co., Chicago, Ill.
Folder. Potheads.

Roth Bros. & Co., Chicago, Ill.
Bulletin No. 199. Direct current motors for band saws, 8 pages.

Alter Light Co., Chicago, Ill.
Mailing folder. Fixture plates and hooks.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Pamphlet. Radiator type transformers for the New Haven system, 8 pages.
Advertising Leaflet. Show window displays.
Folder No. 4284. Railway lightning protection, 10 pages.

W. R. Ostrander & Co., New York.
Mailing card. Annunciators.

Pittsburgh Gage and Supply Co., Pittsburgh, Pa.
Folder. Electric washer and wringer.

Delta-Star Electric Co., Chicago, Ill.
Mailing card. S & C Lightning arrester.

A. F. Daum Co., Pittsburgh, Pa.
Bulletin J 15-4-15. Fuse strip for refillable fuses.

Gleason-Tiebout Glass Co., New York.
Mailing card. Polycase and Camia lighting glassware.

F. Jos. Lamb, Detroit, Mich.
Folder. Electric starting and lighting units.

Trumbull Electric Mfg. Co., Plainville, Conn.
Folder. Cutouts and combination switches.
Insert. Flush receptacle plates.

Fearn Co., Baltimore, Md.
Folder. Calorel relaster for shoes.

Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Mailing folder. Unit type battery charging panelboards.

Stewart-Skinner Co., Worcester, Mass.
Folders. Electric hand lanterns.

Hytee's Factories, Inc., Indianapolis, Ind.
Folder. Dad's electric lantern.

JOVIAN LEAGUES

For the information of Jovians who visit any of the following cities we give below the time and place at which each of the several Luncheon Clubs meet:

Akron—Monday, 11:30 a. m., Black Whale Inn.

Baltimore—Thursday, 12:30 p. m., Emerson Hotel.

Benton Harbor—Second Tuesday of month, place determined by members.

Bluefield—Last Saturday of month, 7:30 p. m., Altamont Hotel.

Boise—Every other Thursday, 12 m., Commercial Club or Owyhee hotel.

Buffalo—Saturday, 12:30 p. m., Lafayette Hotel.

Calgary—Twice a month, 12:15 p. m., Cronn's Rathskeller.

Charlotte—First and third Saturday of month, 1 p. m., Gem Cafe.

Chattanooga—Thursday, 12:30 p. m., Read House.

Chicago—Monday, 12:15 p. m., Hotel Sherman.

Cincinnati—Every other Monday, 12:30 p. m., Gibson Hotel.

Cleveland—Thursday, 12 m., club rooms, Hollenden Hotel.

Columbus—Every other Thursday, 6 p. m., and 12 m., alternately different hotels.

Dallas—Monday, 12 m., Oriental Hotel.

Dayton—First and third Monday of month, 12 m., Algonquin Hotel.

Des Moines—Sat. 12:30 p. m., Kirkwood and Randolph, alternately.

Detroit—First and Third Saturday of month, 1 p. m., Board of Commerce.

Duluth—Second and fourth Wednesday, 12:15 p. m., St. Louis Hotel.

Erie—First and third Monday of each month, 6:30 p. m., Reed House.

Fort Wayne—15th of each month, hour selected, Wayne Hotel.

Fort Worth—Tuesday, 12:15 p. m., at different cafes.

Galveston—Third Monday of month, Galveston Commercial Association.

Grand Rapids—First Sat. of month, 12:15 p. m., Association of Commerce.

Hartford—Thursday, 12:30 p. m., Bond's Cafe.

Houston—Tuesday, 12:15 p. m., Bender Hotel.

Huntington—Last Friday, each month, Frederick Hotel.

Indianapolis—Monday, 12:15 p. m., Hotel Severin.

Knoxville—First Tuesday of month, 12 m., Imperial Hotel.

La Crosse—Second and last Monday of month, 12 m., La Crosse Club.

Lethbridge—First Monday of month, 8 p. m., offices of Municipal Railway.

Lexington—First Tuesday after tenth of month, Phoenix Hotel.

Los Angeles—Wednesday, 12 m., Christopher's, No. 551 S. Broadway.

Louisville—Tuesday 12:15 p. m., Preston Hotel.

Milwaukee—Every other Tuesday, 12:15 p. m., Hotel Blatz.

Minneapolis—Every other Tuesday, 12 m., breakfast room, Rogers Hotel.

Montreal—Thursday, 12:30 p. m., Cooper's Restaurant, Notre Dame street West.

Nashville—First and third Saturdays, 12:30 p. m., and second and fourth Thursdays, 6:30 p. m., Tulane Hotel.

New Castle—Every Wednesday, 12 m., Y. M. C. A.

New Orleans—Second and Fourth Tuesday, 12:05 p. m., Hotel De Soto.

New York—First and third Wednesday of month, 12:30 p. m., Hotel Martinique.

Norfolk—Fourth Friday of month, 8 p. m., Hotel Fairfax.

Oklahoma City—Friday, 12 m., Skirvin Hotel.

Peoria—First and third Saturday of month, 1 p. m., Jefferson Hotel.

Philadelphia—Thursday, 12:30 p. m., Hotel Adelphia.

Pittsburgh—Thursday, 12:15 p. m., Fort Pitt Hotel.

Pittsfield—First Saturday of each month, 6:30 p. m., Wendell Hotel. Informal lunch every Wednesday, 12:15 p. m., G. E. Co.'s restaurant, Kellogg st.

Portland—Friday, 12:15 p. m., Benson Hotel.

Richmond—Fourth Tuesday each month, 1 p. m., Business Men's Club.

Rochester—Thursday, 12:15 p. m., Chamber of Commerce.

Sacramento—Saturday, 12:15 p. m., Peerless Cafe.

St. Louis—Tuesday, 12:30 p. m., American Annex, Market street.

St. Paul—First and third Thursday, 12:10 p. m., Emporium Tea Room.

Salt Lake—Thursday, 12:15 p. m., Louvre Cafe.

San Antonio—Tuesday, 12:30 p. m., Menger Hotel.

San Francisco—Wednesday 12:15 p. m., 621 Bush street.

Schenectady—Third Wednesday of month, 12:15 p. m., Glenn's Restaurant.

Seattle—Friday, 12:30 p. m., Hotel Lincoln.

Sioux City—Thursday, 12 m., different hotels.

Spokane—First and third Wednesdays, 12 m., Spokane Hotel.

Springfield, Ohio—Last Friday of month, 12 m., Commercial Club.

Syracuse—Saturday, 12:15 p. m., Empire Hotel.

Tacoma, Wash.—Tuesday, 12 m., Grill Room, Hotel Olympus.

Toledo—Saturday 12 m., Kaiserhof, States Inn, and Stifler & Kest's Cafe.

Toronto—Friday, 1 p. m., Prince George Hotel.

Twin Falls—Third Thursday, 7 p. m., Room 5, Power Building.

Waco—Thursdays, 12 m., Riggins Hotel.

Warren—Second and fourth Friday, 6:30 p. m., at different places.

Washington, D. C.—Wednesday, 12:30 p. m., Commercial Club.

Wichita—Second and last Saturday of month, 12 m., Wichita and Kansas Clubs, alternately.

Winnipeg—Every other Wednesday of month, 12:15 p. m., St. Regis Hotel.

NEWLY APPROVED FITTINGS

Cabinets

Cabinets shown by tests and examinations conducted by the Underwriters' Laboratories to be in accordance with the requirements of the National Board of Fire Underwriters. Made by A. M. Kailing Co., 280 West Water street, Milwaukee, Wis.

Cabinets shown by tests conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters. Made by Federal Electric Co., Pittsburgh, Pa.

Cables, Armored

Armored cables shown by tests and examinations conducted by the Underwriters' Laboratories to be in accordance with the requirements of the National Board of Fire Underwriters. Marking: a green cord parallel with outer braid and armor. Made by Smurr & Kamen Co., 313 N. Whipple street, Chicago, Ill.

Fixture Wire

Marking: Two green and one red threads laid parallel to wire, between rubber insulator and braid. Made by Goodyear Rubber Insulating Co., 105 East 131st street, New York.

Lighting Devices

1,125,605. *Plug for Incandescent Electric Lamps.* William C. Tregoning, Cleveland, Ohio, assignor, by mesne assignments, to Benjamin Electric Mfg. Co., Chicago, Ill. ..

Lightning Rods

Lightning rods conforming with Underwriters' Laboratories' standards and bearing approval label. Made by Electra Lightning Rod Co., 167 W. Washington street, Chicago, Ill.

Simplex equipment, bearing approval label. Made by Cole Bros. Lightning Rod Co., 316 S. Seventh street, St. Louis, Mo.

Lightning rod apparatus bearing approved labels of the Underwriters' Laboratories are also made by the following concerns: Goshen Lightning Rod Co., Goshen, Ind.; Geo. R. Kress, 1900 Brighton road, Pittsburgh, Pa.; Reyburn, Hunter & Co., 488 North American street, Philadelphia, Pa.

Switches, Push Button Flush

Push button flush switches, shown by examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriers. Made by Union Electric Co., Trenton, N. J.

Wiring, Conduit, Insulators

1,126,362. *Conduit-Outlet Fitting.* Carl H. Bissell, Syracuse, N. Y., assignor to Crouse-Hinds Co., Syracuse, N. Y.

Electrical Prosperity Week Meeting at Toledo

Electrical men and retail merchants of Toledo and other Northern Ohio cities gathered at the Commerce Club, Toledo, Thursday evening, May 6, to hear of the plans for the big Electrical Prosperity Week campaign. About 275 representative men, all that could crowd into the hall, were present. The meeting was held under the auspices of the Toledo Jovian League. E. R. Kelsey, publicity manager of the Toledo Railways and Light Company, acted as chairman of the evening. Guy H. Oliver, Tribune of the Toledo Jovian League, called the meeting to order and introduced Mr. Kelsey, who is also secretary of the Toledo Rotary Club. J. M. Wakeman, general manager, and Harry W. Alexander, director of publicity of the Society for Electrical Development, were the principal speakers. Frank R. Coates, president of the Toledo Railways and Light Company, made a brief speech endorsing the work of the society and the plans for the big sales campaign.

Electrical Men Lost With the "Lusitania"

Among the Americans who were lost when the Lusitania went down off the south coast of Ireland on May 7, were several men well known in electrical circles in this country. The men who were lost include Isaac B. Trumbull, secretary and treasurer of the Connecticut Electric Mfg. Co. of Plainville, Conn., Elbert Hubbard, who became a Jovian several years ago and since that time has given a number of lectures at various electrical conventions, and F. S. Pearson, who was a director in a number of electrical corporations. Mr. Pearson had large interests in Mexico, South America and abroad. Other electrical men on the ship, who were saved by the rescuing parties, include A. J. Byington, who represents the Westinghouse Electric & Mfg. Co. in Brazil; E. B. Tootal, who had recently been conferring in this country on electrical properties with H. L. Doherty & Co., and E. M. Collis of the Commonwealth Edison Co. of Chicago. Mr. Collis was on his way to England to get a legacy, which had recently been left him by deceased relatives.

"Trade of the United States with Other American Countries, 1913-1914," is the title of a booklet just published by the Bureau of Foreign and Domestic Commerce, Department of Commerce. American manufacturers and producers in all lines will find this document of practical value in determining the kinds, quantities, and values of merchandise exported from the United States to each country of the western hemisphere, with annual purchases amounting to two billions of dollars.

The production of static electricity by friction of pulleys and belts has been assigned as the cause of recent dust explosions. Although experiments have not been conducted along this line to show that a dust cloud can be ignited in this manner, a recent experiment at Pittsburgh showed very clearly that sufficient static electricity could be produced by a very small pulley and shaft to ignite gas readily. A series of experiments is being planned under the direction of the U. S. Bureau of Mines in order to determine if static electricity can produce ignition of the dust while in suspension.

RECENT ELECTRICAL PATENTS

Controlling and Regulating Devices

1,137,840. *Overload and Reverse Current Relay.* Frank Conrad, Swissvale, Pa., assignor to Westinghouse Electric and Mfg. Co.

1,138,632. *Electric Regulation.* John L. Creveling, New York, N. Y., assignor to Safety Car Heating and Lighting Co.

1,138,754. *Circuit-Interrupter.* Ford W. Harris, Wilkinsburg, Pa., assignor to Westinghouse Electric and Mfg. Co.

Electric Switches and Cutouts

1,138,212. *Electric Switch.* Jay H. Hall, Cleveland, Ohio, assignor to The Electric Controller and Mfg. Co., Cleveland, Ohio.

1,138,224. *Electrical-Switch Key.* William Kaisling, Chicago, Ill., assignor to Kellogg Switchboard & Supply Co., Chicago, Ill.

1,138,287. *Safety-Switch for Electric Train Controls.* Roy Hamlen, Oakland, Cal., assignor of forty one-hundredths to George Tate, Oakland, Cal.

1,138,673. *Switching Device.* Benjamin G. Lamme and John L. McK. Yardley, Pittsburgh, Pa., assignors to Westinghouse Electric and Mfg. Co.

1,138,677. *Electrically-Operated Switch.* Walter O. Lum, Wilkinsburg, Pa., assignor to Westinghouse Electric and Mfg. Co.

1,138,752. *Key-Operated Rotary Switch.* Monroe Guett, Hartford, Conn., assignor to The Hart & Hegeman Mfg. Co., Hartford, Conn.

1,138,763. *Electric Switch.* Charles J. Klein, Milwaukee, Wis., assignor to The Cutler-Hammer Mfg. Co., Milwaukee, Wis.

1,138,874. *Electric Switch.* Charles J. Klein, Milwaukee, Wis., assignor to The Cutler-Hammer Mfg. Co., Milwaukee, Wis.

1,139,278. *Electric Switch.* George H. Hart, West Hartford, Conn.

Generators, Motors, and Converters

1,137,729. *Electric Motor.* Homer E. Adams, Fort Worth, Tex.

1,138,254. *Dynamo-Electric Machine.* Octave François Sire, Paris, France.

1,138,286. *Dynamo-Electric Machinery.* Leon Victor Grillet and Jean Baptiste Truchetet, Paris, France.

1,138,672. *Dynamo-Electric Machine.* Benjamin G. Lamme, Pittsburgh, Pa., assignor to Westinghouse Electric and Mfg. Co.

1,138,912. *Dynamo-Electric Machine.* Milton E. Thompson, Ridgway, Pa.

1,139,203. *Direct-Current Machine.* Charles W. Girvin, San Francisco, Cal., assignor to Girvin Electrical Development Co., Limited, Honolulu, Hawaii.

Heating Devices

1,138,154. *Electric-Resistance Welding.* Arthur M. Stanley, Lynn, Mass., assignor to General Electric Co.

1,138,841. *Electric Sad-Iron.* William A. Braun, Canal Dover, Ohio, assignor to Dover Mfg. Co., Canal Dover, Ohio.

1,139,001. *Electrical Water-Heater.* Sidney Lé Fèvre Varvel, Melbourne, Victoria, Australia.

1,139,069. *Electric Vulcanizer.* Carl A. Pfanstiehl, North Chicago, Ill.

1,139,076. *Resistance for Electric Heaters.* Edwin A. Rutenber, Logansport, Ind.

Lighting Devices

1,137,773. *Detachable Lamp.* John E. Marsden, Philadelphia, Pa.

1,137,831. *Electric-Lighting System for Automobiles.* Joseph Bijur, New York, N. Y.

1,138,297. *Electric Socket and Shade-Holder.* George P. Knapp, Bridgeport, Conn., assignor to Harvey Hubbell, Incorporated, Bridgeport, Conn.

Measuring and Recording Instruments

1,137,873. *Metering System.* Paul M. Lincoln, Pittsburgh, Pa., assignor to Westinghouse Electric and Mfg. Co.

1,138,406. *Electrically-Operated Time-Switch.* James W. Pennewill and Mose R. Buchanan, Silver City, N. Mex.

1,138,513. *Electric Meter.* Waldemar M. Stempel, State College, Pa.

1,138,690. *Meter.* Albert B. Rypinski, New York, N. Y., assignor to Westinghouse Electrice and Mfg. Co.

1,138,979. *Electrically-Driven Clock.* Thomas Rushton, Upper Holloway, London, England.

1,138,989. *Time-Clock Mechanism.* Alfred Louis Sohm, Los Angeles, Cal., assignor to Sohm Electric Signal & Recording Co., Spokane, Wash.

Statement of the ownership, management, etc., of the ELECTRICAL RECORD, published monthly at New York Post Office, required by Act of Congress of August 24, 1912, for April 1, 1915.

Editor, George A. Wardlaw, 154 Hicks Street, Brooklyn, N. Y.; Managing Editor, Geo. A. Wardlaw, 154 Hicks Street, Brooklyn, N. Y.; Business Manager, W. T. Call, 669 East 32d Street, Brooklyn, N. Y.; Publisher, The Gage Publishing Co., Inc., 114 Liberty Street, New York.

Owners: Gage Publishing Co., Inc., 114 Liberty Street, New York.

Stockholders. N. W. Gage, Hotel Colonial, New York City; W. T. Call, 669 East 32d Street, Brooklyn, N. Y.; J. F. McClure, 8 Winthrop Terrace, East Orange, N. J.; J. C. Prior, 258 State Street, Flushing, L. I.

Known bondholders, mortgagees and other security holders, holding one per cent. or more total amount of bonds, mortgages, or other securities—(none).

(Signed) W. T. CALL, Business Manager.

Sworn to and subscribed before me this 19th day of March, 1915.

OLIVER R. GRANT,
Notary Public No. 1398, New York County, New York.
(Commission expires March 30, 1915.)

WANTS—FOR SALE—AGENTS

FIRM IN THE NETHERLANDS (neutral country), well acquainted with electrical supplies and allied trades, is willing to act as buying agency for American concern. Address S. A. J., Suite 610, Evening Post Bldg., New York.

MAN TO TAKE CHARGE of Tungsten lamp factory. Must know costs of production of both Tungsten and Nitrogen lamps. State age, salary, experience. Box 6-A, c/o ELECTRICAL RECORD.

WANTED—Manufacturers' agent in Atlanta, Ga., St. Paul or Minneapolis to handle line of Electric Lanterns, Electric Flashlights and other specialties. Must be responsible party, handling other lines of well-known electrical goods. Answer advising fully as to facilities and referring the companies with whom you have been doing business. Box 6-B, c/o ELECTRICAL RECORD.

WANTED TO PURCHASE belted revolving field alternator, 75 K.W., 900 rev., 60 cycles, 8 poles. We must rewind stator winding to suit our requirements, otherwise generator shall be in good condition. Let us know what you can offer for spot cash payment and we will communicate with you. Apply Box 6-C, c/o ELECTRICAL RECORD.

FOR SALE CHEAP. ELECTRICAL CONTRACTING AND FIXTURE BUSINESS. Do you want to run your own business, or work all the best years of your life for some one else? Here is your chance. Do you want to Change?

We offer an old established Electrical Contracting Business, having in connection a very complete plant for the manufacture of Electric Lighting Fixtures of all kinds and of the highest grade.

It is situated in Milwaukee, Wis., one of the finest cities in the Middle West of over 300,000 inhabitants, and is doing a large trade locally and throughout the Northwest.

This is a chance of a lifetime for a young man who is a designer of fixtures or who has a knowledge of the Electric Fixture business to succeed to a prosperous business already built up.

Wishing to settle an estate is our reason for selling. A few thousand dollars is all that is required to handle this proposition. We can arrange easy terms for the purchaser. We have ample facilities which are of the best that will enable you to increase the business if desired, and become one of the most successful business men of the city. This would be just the place for two or more to engage in a Wholesale Electric Fixture Business.

Address HENRY J. WRIGHT, Executor,
Care Apartment 5, 150 Biddle Street,
Milwaukee, Wisconsin.

POSITION WANTED AS MANAGER OR BUYER. 20 years' experience in Electrical Construction and Supply business, now with large supply house as manager, but desires to make a change. Box 6-D, c/o ELECTRICAL RECORD

CLASSIFIED INDEX

ACETYLENE LIGHTERS.
See Lighters, Acetylene.

ADAPTERS, Auto Lamp.

For changing Gas or Oil Lamps to Electric.

GENERAL ELECTRIC CO., Schenectady, N. Y.
HUBBELL, INC., HARVEY, Bridgeport, Conn., "Dazlite."
MANHATTAN ELEC'L SUPPLY CO., 17 Park place, New York.
METAL SPECIALTIES MFG. CO., 748 W. Monroe st., Chicago, Ill., "Gil-Bo."
MORSE, FRANK W., Boston, Mass., "Electrofier."
PLUME & ATWOOD MFG. CO., Waterbury, Conn.
ROSEN & CO., A. W., 610 Broadway, New York, N. Y.
STANDARD ELEC. NOVELTY CO., 10 N. Desplaines st., Chicago, Ill.

Black Mfg. Co., Fort Wayne, Ind.
Campbell Co., A. S., Boston, "Cello."
Castle Lamp Co., Amesbury, Mass.
Chicago Electric Mfg. Co., Chicago.
Cole & Co., Henry, Boston, Mass.
Gray & Davis, Cambridge, Mass.
Horn & Brannen Mfg. Co., Phila.

ADAPTERS, Lamp.

Tungsten Adapters.
Socket Adapters & Extensions.

BENJAMIN ELECTRIC MFG. CO., 120 So. Sangamon st., Chicago, Ill. (Tungsten Adapters).
BRYANT ELEC. CO., Bridgeport, Conn. (Candelabra).
FEDERAL SIGN SYSTEM (ELEC.), Lake & Desplaines sts., Chicago, Ill.
HUBBELL, INC., HARVEY, Bridgeport, Conn.
WHITE MFG. CO., J. H., 111 N. Third st., Brooklyn, N. Y. (Tungsten).

Advance Mfg. Co., Pittsburgh, Pa.
Arrow Electric Co., Hartford, Conn.
Erikson Elec. Co., L., Boston, Mass. (Tungsten Adjustable Joint).
Phila. Elec'l & Mfg. Co., Phila., Pa.
Westinghouse Lamp Co., New York.

ADJUSTABLE FIXT. BRACKETS.
See Fixtures, Adjustable.

ADJUSTERS, Cord & Lamp.

AUSTIN & CO., M. B., 700 Jackson blvd., Chicago, Ill., "Gem."
CONDIT ELECTRICAL MFG. CO., Boston, Mass., "Saca."
DIAMOND STATE FIBRE CO., Bridgeport, Pa.
GUND MFG. CO., 320 Jay st., La Crosse, Wis., "Two Ball."
McGILL MFG. CO., 39 Oak st., Valparaiso, Ind., "Innovate."
MATTHEWS & BRO., W. N., 3705 Forest Park blvd., St. Louis, Mo., "Easy."
MORSE, FRANK W., Boston, Mass. ("Handy" Cord and "Webster" Lamp Adjuster).
PHELPS MFG. CO., Detroit, Mich. ("Any Angle" Lamp Fixture).
STEWART ELEC. CO., FRANK H., 37 N. 7th st., Philadelphia, Pa.
TRUMBULL ELECTRIC MFG. CO., Plainville, Conn.
YOST ELEC. MFG. CO., Toledo, O. ("Electrogrip" Lamp Adjuster).
Advance Mfg. Co., Pittsburgh, Pa., "Heinz."
American Enamel Co., Providence.
American Vulcanized Fibre Co., Wilmington, Del., "Q. & C."
Bates, H. A., Garwood, N. J., "Slip-on."
Carter & Co., J. W., Abilene, Texas, "Eclipse."
Cohn, Adolph, West Hoboken, N. J., "Rela."
C. & D. Mfg. Co., Dayton, O.
Electric Specialty Mfg. Co., Pittsburgh, Pa., "King."
Estes & Sons, E. E., New York (Wood).
Gam Mfg. Co., Lancaster, Pa.
Hagstrom Bros. Mfg. Co., Lindsborg, Kan. (Push Button).
Harter Specialty Co., Waukegan, Ill.
Johnny Co., Greenville, O.
Lorentz, Henry E., Baltimore, Md.
Milam & Son, B. C., Frankfort, Ky.
Novelty Turning Co., Norway, Me.
Reel Adjustable Fixture Co., Chicago.
Runzel-Lenz Electric Mfg. Co., Chicago, Ill. ("R-L" Telephone Switchboard Cord Length Adjuster).

ADJUSTERS, SOCKET CHAIN.
See Attachments, Socket.

ADJUSTERS, Switchplate.

Elec. Apparatus Co., Chicago, Ill.

ADVERTISING DEVICES.

Electrically Illuminated and Operated.

REYNOLDS ELEC. CO., 422 So. Talman ave., Chicago, Ill., "Reco."

Electro Novelty Co., Chicago, Ill.
Goldberg Display Fixtures, New York (Display Sample Boards).
Harvey, W. A., Scranton, Pa., "Display-O-Graph."
Meyercord Co., Chicago, Ill. (Advertising Specialties).
Multiplex Display Fixture Co., St. Louis (Display Sample Boards).
National Automatic Advertising Co., Chicago, Ill. (Stereopticon Advertising Machine).
Newman Mfg. Co., Cincinnati, O. (Window Display).
Thorne Mfg. Co., C. L., Chicago, Ill. (Window Tapper).
Turner-Ligon Advertising Clock Co., Union City, Tenn.

AGENTS, Manufacturers.

See Pages 202-203-204

ALABASTER BOWLS.
See Bowls, Marble & Alabaster.

ALARMS, BURGLAR.
See Burglar Alarms, also Annunciators also Springs.

ALARMS, FIRE.—See Fire Alarms.

ALARMS, Rain.

Electric Devices & Mfg. Co., Chicago, Ill.

ALARMS, Tank.

OSTRANDER & CO., W. R., 22 Dey st., New York, N. Y., "Neu."
PARTRICK & WILKINS CO., Philadelphia, Pa.
STANLEY & PATTERSON, 23 Murray st., New York, N. Y., "Patterson."
WALDMAN, JOHN J., 136 Liberty st., New York, N. Y.

Irish Electric Co., W. F., New York, "Shamrock."

ALUMINUM.

ALUMINUM CO. OF AMERICA, Pittsburgh, Pa.

Elec. Smelting & Aluminum Co., Lockport, N. Y.
So. Aluminum Co., Whitney, N. C.

ALUMINUM FUSES.
See Fuses, Open Link.

AMMETERS.—See Instruments.

ANCHOR SCREWS.
See Bolts, Expansion.

ANCHORS, Guy, also Rods.

BARNES & KOBERT MFG. CO., Milldale, Conn., "B. & K."
CROUSE-HINDS CO., Syracuse, N. Y., "Harpoon." "Adjustarod."
ELECTRIC OPERATIONS CO., Bush Terminal, Brooklyn, N. Y.
GUND MFG. CO., 320 Jay st., La Crosse, Wis., "D. & T."
LANZ & SONS, M., Pittsburgh, Pa.
MATTHEWS & BRO., W. N., 3705 Forest Park blvd., St. Louis, Mo.
OSHKOSH MFG. CO., Oshkosh, Wis.
ST. LOUIS MALLEABLE CASTING CO., 7777 N. Conduit ave., St. Louis, Mo., "O. K."

Barbed Anchor Mfg. Co., Louisville.
Benicia Iron Works, San Francisco.
Bluffton Anchor Co., Bluffton, O.
Chance Mfg. Co., Centralia, Mo., "Never Creep."
Everstick Anchor Co., St. Louis.
Falls Elec. Co., Lima, O., "Clum."
Hallett Iron Wks., Harvey, Ill., "Hiawatha."
Johns-Manville Co., H. W., New York, N. Y., "J-M."
Klein & Sons, Mathias, Chicago, Ill.
Line Material Co., So. Milwaukee, Wis. (Guy Rods).
Miller Anchor Co., Norwalk, O., "Safety."
New England Bolt & Supply Co., Everett, Mass. (Guy Ropes).
Oliver Iron & Steel Co., Pittsburgh, Pa. (Guy Rods).
Simpson Anchor Co., Niagara Falls.
Specialty Device Co., Cincinnati, O., "Bierce."
Universal Cable Grip Co., Syracuse, N. Y., "Red Top."
Wapak Hollow Ware Co., Wapakoneta, O.

ANNEALING FURNACES AND OVENS.—See Furnaces, Elec.

ANNUNCIATORS, Limousine.

Cowels & Co., C., New Haven, Conn.
O'Brien Co., Joseph F., New York.

ANNUNCIATORS, Standard.

Elevator, Telephone, Hotel, Burglar Alarm.

ANSONIA ELECTRICAL CO., Ansonia, Conn.
CONNECTICUT TELEPHONE & ELECTRIC CO., Meriden, Conn.
DE VEAU TELEPHONE MFG. CO., 477 18th st., Brooklyn, N. Y., "Auth."
EDWARDS & CO., New York, "Dixie," "Etonial," "Semaphore."
HOLTZER-CABOT ELECTRIC CO., Boston, Mass.
MANHATTAN ELECTRICAL SUPPLY CO., 17 Park pl., New York.
MENOMINEE ELEC. MFG. CO., Menominee, Mich.
OSTRANDER & CO., W. R., 22 Dey st., New York.
PARTRICK & WILKINS CO., Philadelphia, Pa., "Competition," "King," "Presto," "Guarantee."
STANLEY & PATTERSON, 23 Murray st., New York, N. Y., "Premier."
Couch Co., S. H., Norfolk Downs, Mass., "Coelco."
Hepburn Tele. Mfg. Co., Chicago (Illuminated).
Moon Mfg. Co., Chicago, Ill., "Knapp," "Eclipse," "Acme."
Samson Elec. Co., Canton, Mass., "Ross," "Rival," "Dandy," "Hub."

ANTI-HUMS.

BUNNELL & CO., J. H., 32 Park pl., New York.
MANHATTAN ELEC'L SUPPLY CO., 17 Park pl., New York.

ANTISEPTIC MOUTHPIECES.
See Mouthpieces, Telephone.

ARC LAMP APPLIANCES.
See Specific Articles.

ARMATURE MACHINES.
See Machines, Armature.

ARMATURES.

See Adv. Pages 192-193

ARMORED CABLE.
See Conduit, Interior.

ARMS, CROSS, Concrete.

Ohio Cross Arms Co., Columbus, O.

ARMS, CROSS, IRON.
See Pole Line Hardware.

ARMS, CROSS, (Wood).

BARNES - LINDSLEY MFG. CO., Portland, Ore.
BISSELL CO., F., Toledo, O.
CENTRAL LUMBER CO., Chattanooga, Tenn.
FOWLER & CO., J. H., Fisher Bldg., Chicago, Ill.
LINDSAY BROS. CO., Spokane, Wash.
SOUTHERN EXCHANGE CO., 97 Warren st., New York, N. Y.
WESTERN LUMBER & POLE CO., Spokane, Wash.

Absher Co., W. M., North Wilkesboro, N. C.
Am. Creosote Wks., New Orleans, La.
Am. Cross Arm Co., Chicago, Ill.
Atlantic Creosoting & Wood Preserving Co., Norfolk, W. Va.
Berlin Mills Co., Portland, Me. (Kyanized).
Berthold & Jennings Lumber Co., St. Louis, Mo.
Boggs & McNeill Co., Albany, Ga.
Cohn & Bock, Princess Anne, Md.
Cranston Lumber Co., John A., Wilmington, Del.
Doty (Wash.) Lumber & Shingle Co.
Elkin Machinery Co., Elkin, N. C.
Ferguson Lbr. Co., Little Rock, Ark.
Georgia Tie & Lumber Co., N. Y.
Gulfport (Miss.) Creosoting Co.
Hamilton & Strong, Colville, Wash.
International Creosoting & Cons. Co., Galveston, Tex.
Lacey Lumber Co., Carrier, Miss.
Lord & Co., L. H., Peoria, Ill.
Louisiana Red Cypress Co., New Orleans, La.
Megalfin & Co., Westerville, O.
Morse Lumber Co., Los Angeles.
Noblett Co., E. J., Chattanooga.
Norfolk Creosoting Co., Norfolk, Va.
Roper Lumber Co., Norfolk, Va.
Seattle (Wash.) Timber Supply Co.
South. Pine Mfg. Co., Paducah, Ky.
Swayne R. B., San Francisco, Cal.
Tacoma-Seattle Timber Co., Tacoma.
Texas Arm & Pin Co., Beaumont.
Vuncannon, J. B., West End, N. C.
Wade & Co., Shippensburg, Pa.
Williams Cypress Co., F. B., Patterson, La.
Wykoff Pipe & Creosoting Co., N. Y.
Zeones Lumber Co., Pe Ell, Wash.

ARMS, Mast.

BRADY ELECTRIC MFG. CO., New Britain, Conn.
CUTTER CO., GEO., 411 Notre Dame, South Bend, Ind.
ELECTRIC RAILWAY EQUIPMENT CO., Cincinnati, O.
MORRIS, ELMER P., 136 Liberty st., New York.

Buffalo Specialty Co., Buffalo, N. Y.
Fletcher Mfg. Co., Dayton, O.
Line Material Co., So. Milwaukee, Wis.
Lundin Elec. & Mach. Co., Boston, Mass., "Philbrick."
Phila. (Pa.) Elec'l Mfg. Co.
Russell Elec. Mfg. Co., Providence.

ARRESTERS, Lightning.

Light and Power.

GENERAL ELECTRIC CO., Schenectady, N. Y.
WESTINGHOUSE ELEC. & MFG. CO., East Pittsburgh, Pa., "Wurtz."

Arrow Conductor & Mfg. Co., Chicago.
Brach Supply Co., L. S., Newark, N. J.
Brach Supply Co., L. S., New York.
Delta-Star Elec. Co., Chicago, Ill.
Elec. Service Supplies Co., Phila.
Gifford El. Mfg. Co., Traverse City, Mich.
Lord Mfg. Co., Brooklyn, N. Y., "Multi-Vapo-Gap," "Abacot."
Oleson Spring Co., Toledo, O.
Railway & Industrial Engineering Co., Greensburg, Pa.
Shaw Insulator Co., Newark, N. J.

ARRESTERS, Lightning.

Telephone and Telegraph.

BUNNELL & CO., J. H., 32 Park pl., New York, N. Y., "Union," "Triangle."
CHICAGO FUSE MFG. CO., Chicago.
D. & W. FUSE CO., Providence, R. I.
MANHATTAN ELEC'L SUPPLY CO., 17 Park pl., New York, "Union."
RELIABLE ELEC. CO., Chicago, Ill.
Am. Elec. Co., Chicago, Ill.
Anderson Mfg. Co., Albert & J. M., Boston, Mass., "Ajax."
Automatic Fusible Lightning Arrester Co., Colorado Springs, Colo.
Brach Supply Co., L. S., Newark, N. J.
Butler-Edwards Elec. Co., Easton, Pa.
Chance Mfg. Co., Centralia, Mo., "Sky-Rocket."
Cook, F. B., Chicago, Ill.
Cox Arrester Co., C. E., Eaton, Ohio.
Cracraft, Leich Elec. Co., Genoa, Ill. (Self-Cleaning Shunt Arresters).
Ericsson Mfg. Co., Buffalo, N. Y.
Foote, Pierson & Co., New York, "Argus."
Garford Mfg. Co., Elyria, O.
Gifford Elec. Mfg. Co., Traverse City, Mich., "Paradox."
Harvard Elec. Co., Chicago, Ill.
Howard, A. G., Holdredge, Neb.
Insulator Arrester Co., Duluth, Minn.
Kellogg Switchboard & Supply Co., Chicago, Ill.
Minneapolis (Minn.) El. Co., "Chapman."
National Elec. Specialty Co., Toledo, O., "Vac-M."
P. & M. Co., Chicago, Ill.
Railway & Industrial Engineering Co., Greensburg, Pa.
Royal Elec. Co., Sidney, O., "Hypostat."
Schinn, W. C., Lincoln, Neb.
Stromberg-Carlson Tele. Mfg. Co., Rochester, N. Y.

ARTIFICIAL (PHANTOM) LOAD INSTRUMENTS. — See Instruments, Testing.

ASBESTOS.

Sheet, Paper, Mill Board, Lumber.

Acme Asbestos Covering & Supply Co., Chicago.
Carey Mfg. Co., Phillip, Cincinnati.
Ehret Magnesia Mfg. Co., Phila.
Franklin Mfg. Co., Franklin, Pa.
General Asbestos & Rubber Co., Charleston, S. C.
Johns-Manville Co., H. W., N. Y.
Keasbey & Mattison Co., Ambler, Pa.
New Jersey Asbestos Co., Camden, N. J., "Gladiator."
N. Y. Asbestos Mfg. Co., New York.
Norristown Magnesia & Asbestos Co., Norristown, Pa.
Sall Mountain Asbestos Mfg. Co., Chicago.
Watson Co., H. F., Erie, Pa.

ASBESTOS SHADES.
See Shades, Asbestos.

ASBESTOS, WIRE.
See Wire, Asbestos.

ATTACHMENTS.

Gas Fixture.

BRYANT ELEC. CO., Bridgeport, Conn.
MANHATTAN ELEC'L SUPPLY CO., 17 Park pl., New York, N. Y.
PLUME & ATWOOD MFG. CO., Waterbury, Conn.
TRUMBULL ELEC. MFG. CO., Plainville, Conn.
WALSH MFG. CO., OWEN, 525 W. 26th st., New York, N. Y.
WHITE MFG. CO., J. H., 111 N. Third st., Brooklyn, N. Y.

Am. Brass & Copper Co., New York.
American Pin Co., Waterbury, Conn.
Spencer's Sons, I. S., Guilford, Conn.
Steele & Johnson Mfg. Co., Waterbury, Conn.

ATTACHMENTS, Socket.

Socket Pulls.
Chain Adjusters.
Chain Extensions.

HUBBELL, INC., HARVEY, Bridgeport, Conn., "Ham," "Harding," "Economy."
PEERLESS LIGHT CO., Peerless Bldg., Chicago, Ill. ("Flexo" Socket Pull).
PHELPS MFG. CO., Detroit, Mich.
RITTENHOUSE CO., A. E., Honeoye Falls, N. Y., "Easylite."
Barry Mfg. Co., Boston, Mass.
Empire Engineering & Supply Co., New York.
Premier Novelty Co., Chicago, Ill. ("Just Pull" Socket Pull).

AUTOGRAPHIC RECORDERS.
See Instruments, Recording.

AUTOMATIC SWITCHES.
See Switches, Remote Control; also Switches, Time.

AUTOMOBILE STARTING AND LIGHTING.—See Systems, Auto

AUTOMOBILES, Electric.

American Elec. Car Co., Saginaw, Mich., "Argo," "Broc," "Boland-Grannis."
Anderson Elec. Car Co., Detroit, Mich., "Detroit Electric."
Atlantic Vehicle Co., Newark, N. J.
Atlas Car & Mfg. Co., Cleveland, O. (Trucks).
Automatic Transportation Co., Buffalo, N. Y. (Baggage Trucks).

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Monthly
June, 1915

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Century

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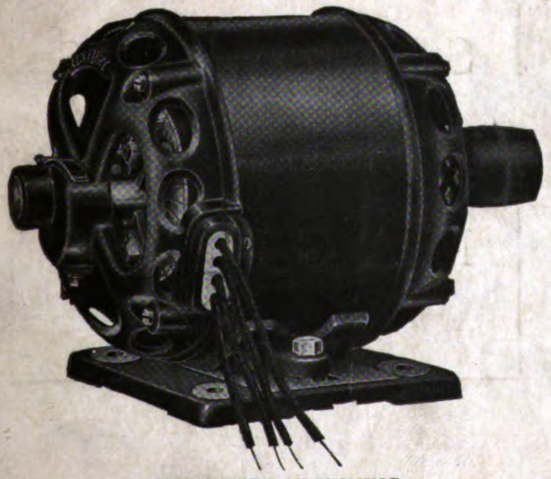
SEE OUR EXHIBIT
BLOCK 4
PALACE OF MACHINERY

FRACTIONAL HORSE POWER

SINGLE PHASE MOTORS

will materially assist in maintaining good lighting service—for 95% of the installations a fuse which will protect under full load is of ample capacity for starting.



THEY KEEP-A-RUNNING

60 Cycle, 1750 R.P.M., 104 Volt Motors

HORSE POWER	FULL LOAD AMPERES	STATIC AMPERES Rotor Locked	SIZE OF ENCLOSED FUSE (A)
1/10	2.0	5.0	2 Amp.
1/8	2.6	7.0	3 Amp.
1/6	3.0	8.2	3 Amp.
1/4	4.0	11.0	5 Amp.
1/2	7.0	17.	8 Amp.

(A) Size recommended for starting under usual full load conditions

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Magnet Wire

In Any Form

you owe it to yourself
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The high quality of this
wire has made it foremost
for many years.

Cotton *Silk* *Enamel*

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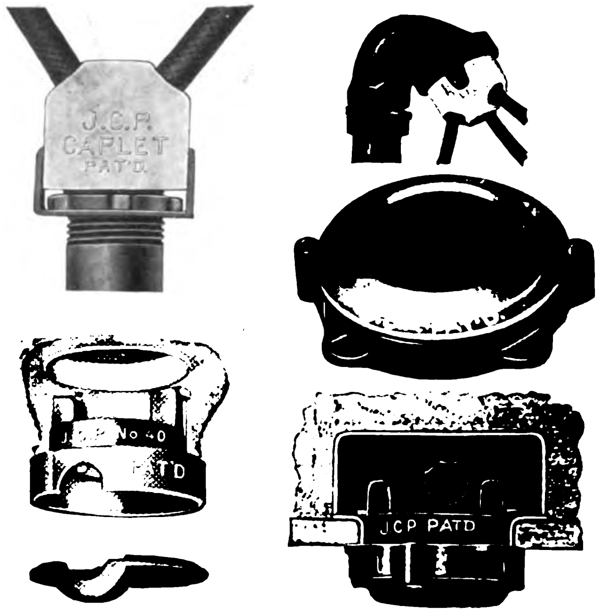

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L. E. Frorup & Co., Sole Distributers, New York City.
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"Nichrome" For Electric Heaters
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"No. 193 Alloy" For Rheostats
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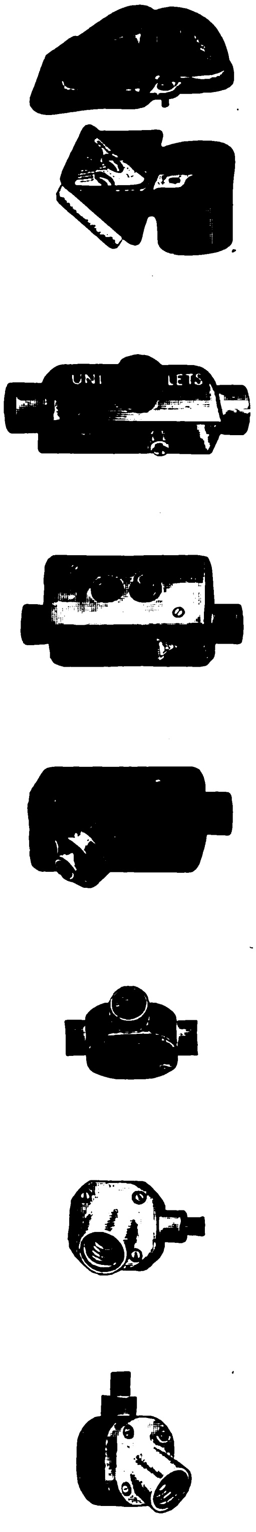

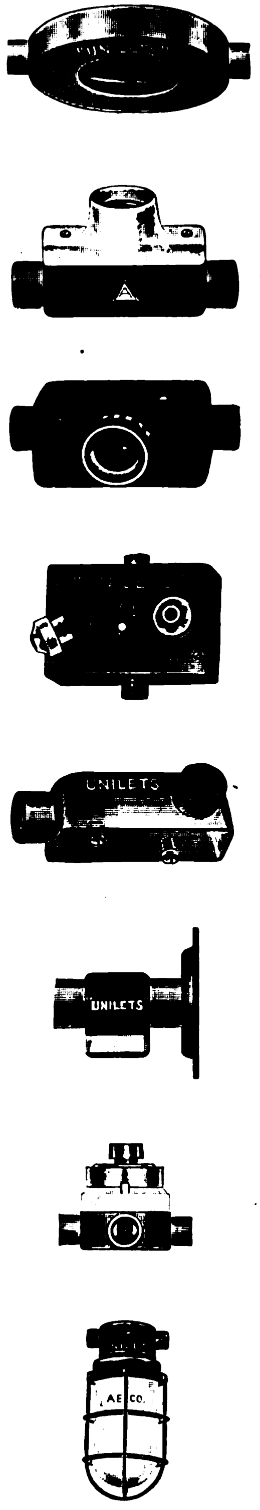

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Standard Fittings

They make a better, longer lasting and more efficient job than the old style cast iron fittings.

The constant and regular use of

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will create for you the satisfied customer, your greatest asset.

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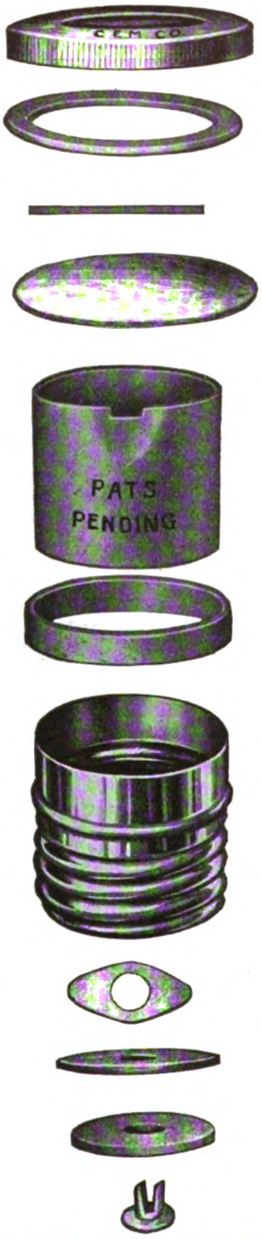
CONNECTICU

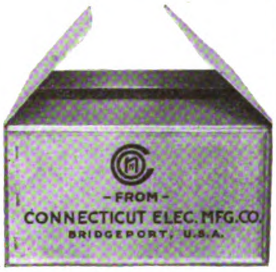
BE PROGRESSIVE

"CONNECT WITH CONNECTICUT"

SOME MORE



Exploded view showing all parts actual size



View of standard package containing 500 plugs neatly packed in corrugated paper cartons, gross weight 18 pounds.

It would cost the following to ship 500 of our fuse plugs via Parcel Post.		Rates via Express to
Zone 1	$ .24	New York
Zone 2	.24	Philadelphia
Zone 3	.44	Baltimore
Zone 4	.83	Toledo
Zone 5	1.22	St. Louis
		Chicago
		Indianapolis
Zone 6	1.61	Kansas City
		Omaha
Zone 7	2.01	Denver
Zone 8	2.40	San Francisco
		Los Angeles
		Salt Lake City

Our New Fibre Fuse Plug

Some real new features unknown to other Plugs, and offering a good argument why you should "be progressive and Connect with Connecticut."

1—Non-breakable. Being of Fibre and not Porcelain or other fragile material, is practically indestructible.

2—Weight 18 lbs. per 500 plugs, packed ready for shipment. Package much smaller and lighter than others.

3—Can forward these plugs via parcel post to any part of country, in lots of 500 plugs.

4—⅓ smaller than standard porcelain plugs.

5—Air space 50% larger than porcelain plugs allowing accurate rating and blowing of plug.

6—Non-fillable.

7—Packed in paper cartons to save weight.

Send for Samples and Prices

Did you get our new catalog No. 5?

Top View

Sectional View showing 50% greate space than porcelain

Bottom View
These views show size of plug

Connecticut Electri

Connecticut and Florence Avenu

NEW YORK
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No. 7. Rue De Messager

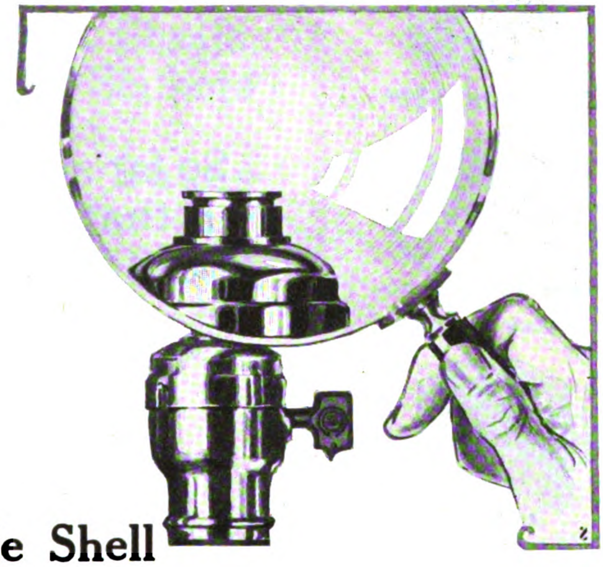
CONNECTICUT

BE PROGRESSIVE

ONNECTICUT SPECIALTIES

"CONNECT WITH CONNECTICUT"

Our New Sockets

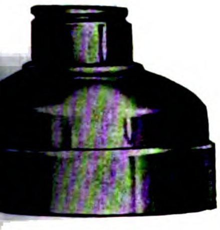


Our Locatable Shell

is for installing sockets inside of husks, so that key will align perfectly with slot in husk. A Special Tool (see illus.) furnished free is used. Simply fasten cap as far as it will easily go on nipple protruding thru husk, then turn socket cap with tool to right until handle points at keyhole in husk, remove tool, connect up socket. You can then snap on bottom shell of socket and key will protrude thru proper slot or keyhole.

THE SOCKET CAN'T WORK LOOSE.

Furnished in all styles and finishes.



of locatable socket cap
sed on all of our key
sockets

Our all porcelain key socket.
Catalogue No. 11025

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Surface Base

Slotted Base

Small Concealed Base

Large Concealed Base

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Condulet Base

Wood Moulding & Pipe Taplet Base

One-Way Metal Moulding Base

Two-Way Metal Moulding Base

KEY
KEYLESS
PULL

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A COMPLETE LINE
CONTAINING
NEW AND UNIQUE FEATURES

So far superior to all other Porcelain Socket
that they are in a class by themselves.

Shells are fastened to Caps and Bases by two screws on t
outside—an easy and secure method and a great advance ov
former methods of fastening by one or two screws on the insid

Now that this up-to-date line is on the market, Fixture Manufactu
ers, Contractors, Central Stations and Isolated Plants cannot affo
to use any other Porcelain Sockets.

ALWAYS SPECIFY "WEBER'

FOR SALE BY

ALL JOBBERS OF ELECTRICAL SUPPLIE

Plain Pendent Cap

Strain Relief Pendent Cap

⅛-inch Cap

¼-inch Ca

LAIN SOCKETS

NGEABLE

FIXTURE
PENDENT
WALL

Interior Fittings are separate from Shells, Caps and Bases, as in Brass-Shell Sockets

All Shells Fit All Caps and Bases

The Same Shells are Used for Key and Pull Sockets

These Sockets are assembled and wired in the same manner as are Brass-Shell Sockets, a great advance over the clumsy methods used n all other Porcelain Sockets.

Can be furnished in either White or Chocolate Glaze. In the absence of specifications, White will be supplied.

FOR PRICE LIST
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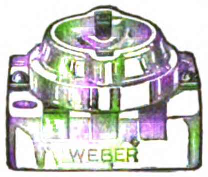
K-W Cleat Base

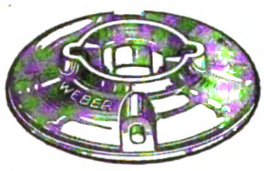
K-W Concealed Base

K-W 2-Wire Moulding Base



K-W 3-Wire Moulding Base

K-W Combination Base



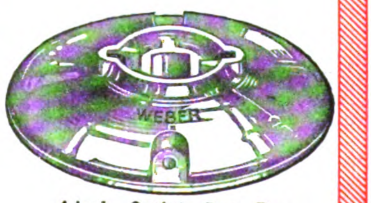
3-in. & 3¼-in. Outlet Box Base

⅜-inch Cap

½-inch Cap

⅜-inch Angle Cap

½-inch Angle Cap



4-inch Outlet Box Base

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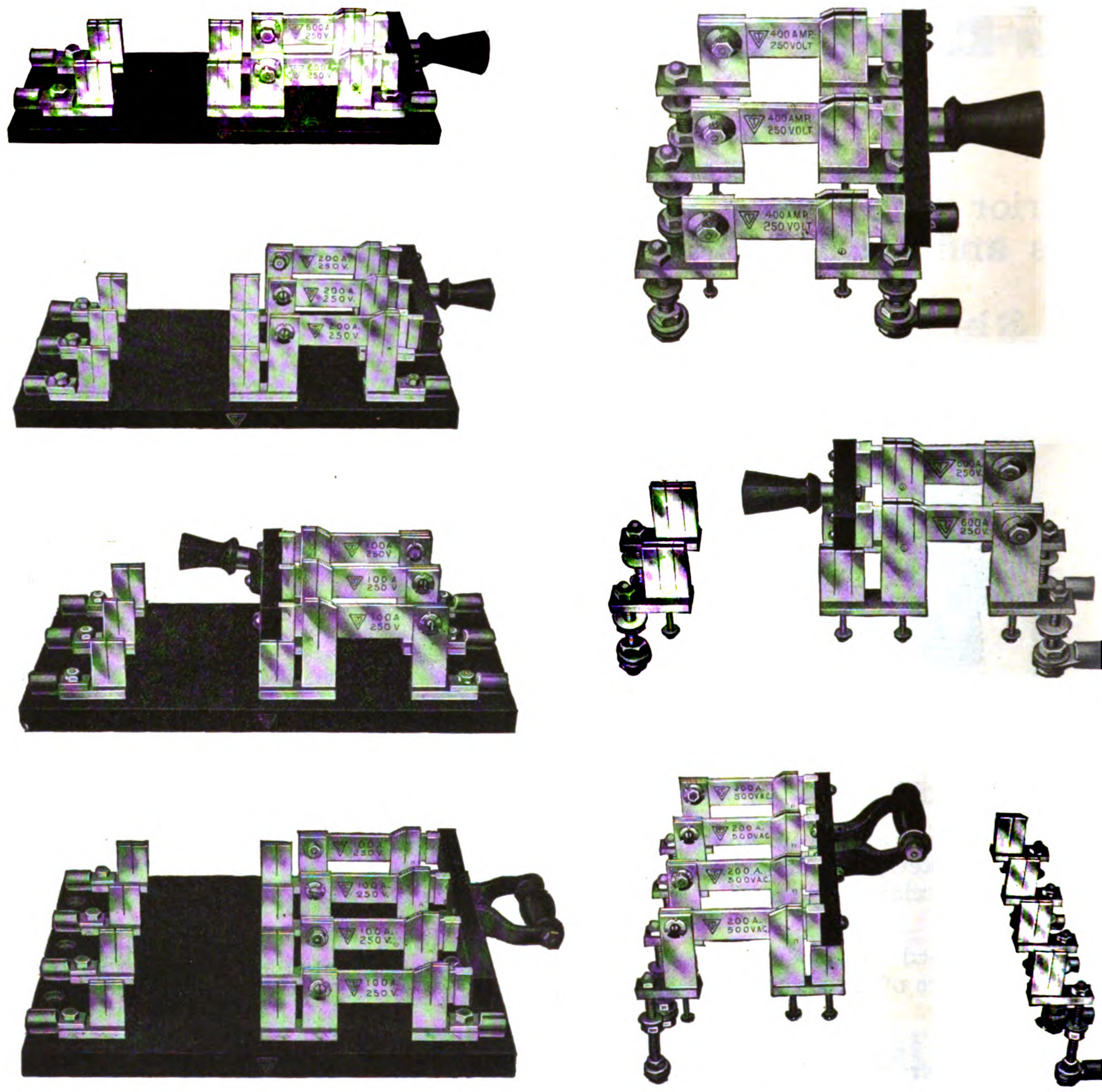
ELECTRIC



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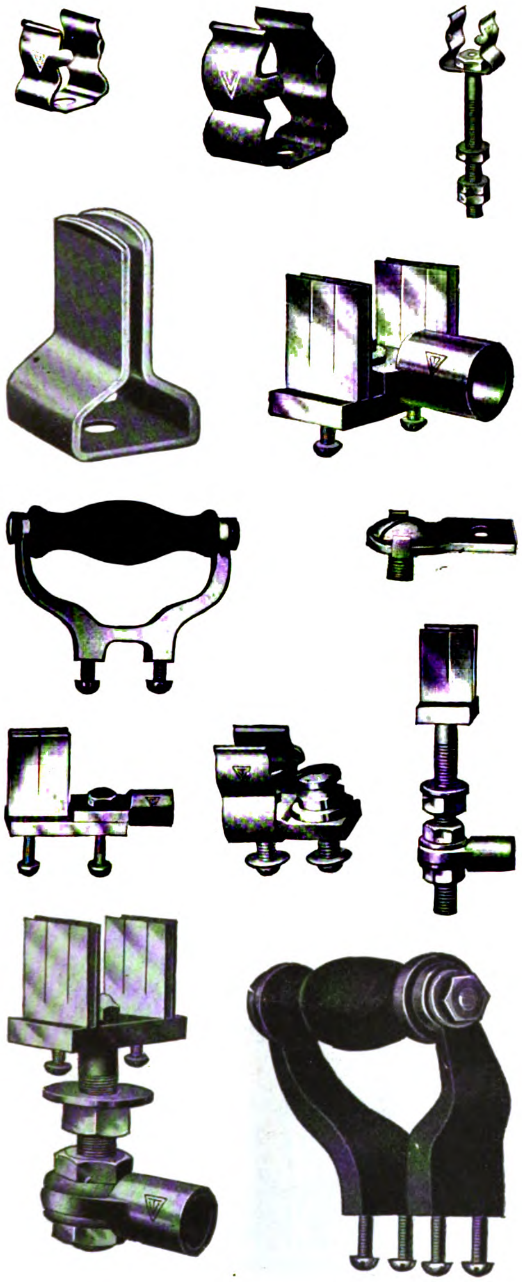

N.E.C. STD. ENC. FUSE No. 16200
200 AMP.
600 VOLT
TRUMBULL-VANDERPOEL EL. MFG. CO.
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"It will be right there and RIGHT when it gets there"

We manufacture a complete line of Panelboards, Switchboards, Cabinets, Knife Switches, etc.

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FREE

"THE COMP

"Security" Brass Shell Sockets

Key Keyless Pull

No. 1070
WITH INS. CHAIN

A feature of the "Security" Sockets is the snap shell lock which is **guaranteed** not to come unfastened—it will, however, unlock readily.

The long Phosphor Bronze spring on our key sockets, is a distinct feature, not contained in other sockets.

We also manufacture a complete line of **Mogul Base Sockets** in both the Brass Shell and Porcelain types.

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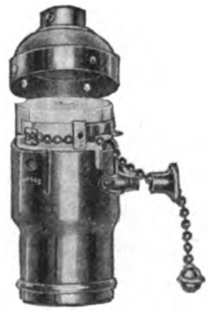

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WITH SHADE HOLDER
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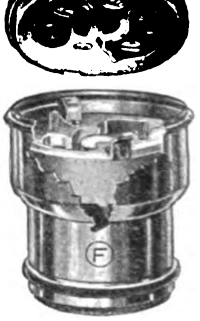

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MAN

ETE LINE”

Interchangeable Porcelain Sockets

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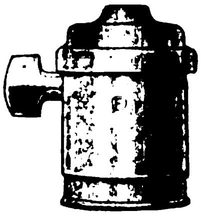

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Superior in every way. They more than meet all requirements.

A distinct advantage of the **Freeman Line** is that all these Sockets are interchangeable with all styles of base.

Remarkable excellence of **key action,** giving free and positive make and break—*an exclusive feature.*

All porcelains made in our own Pottery, thus insuring strength and uniform **quality.**

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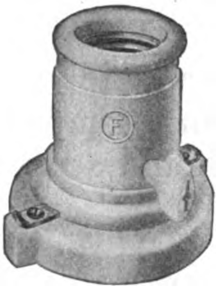

No. 138

Samples and Prices to the Trade on request

ELECTRIC COMPANY

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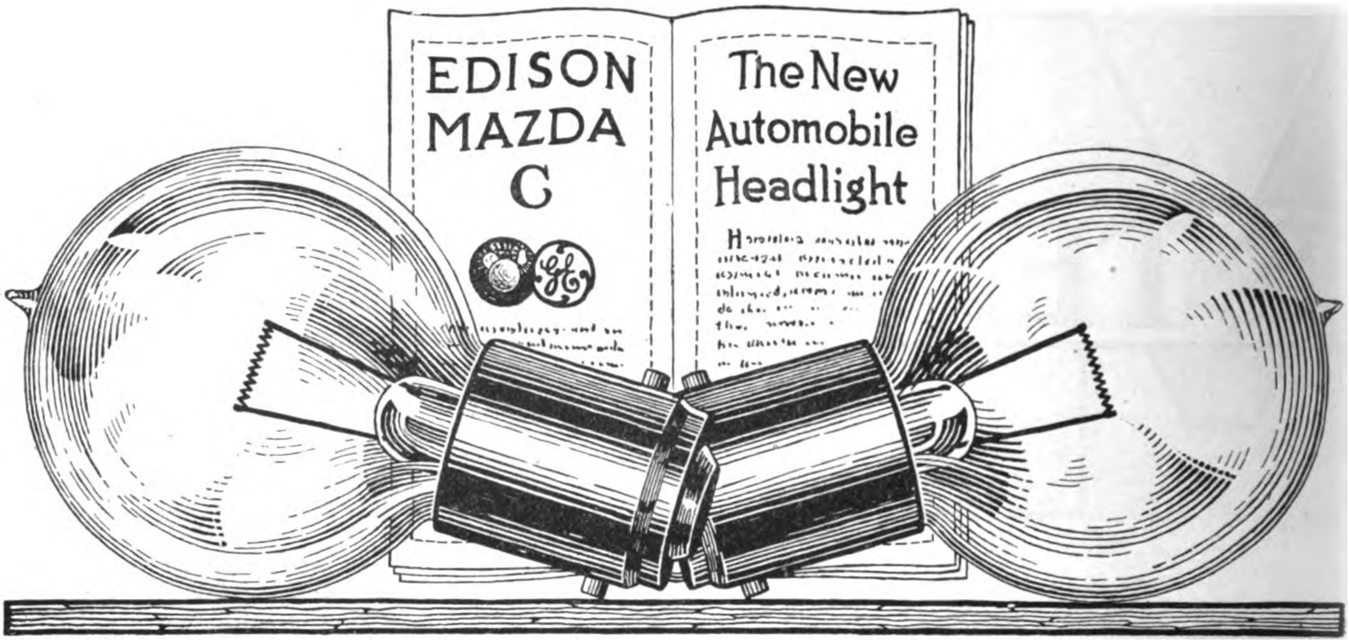


40% More Light with no Increase in Current Consumption

THE development of this new lamp, utilizing the advantage of an inert gas instead of a vacuum, makes it by far the most efficient automobile lamp we have ever produced. This 2½ ampere MAZDA C lamp, for 6-7 volt circuits, gives about 21 candle-power as compared to 15 candle-power for the corresponding vacuum lamp. The light is not only more powerful without increased glare but also whiter and of a better quality. Moreover, the bulb blackens less rapidly thus giving the lamp a longer useful life in service.

Thousands of motorists already are using the new lamp and the rapidly increasing demand almost exceeds the supply. Miniature lamp agents must be able to supply this demand and should send in their orders at once.

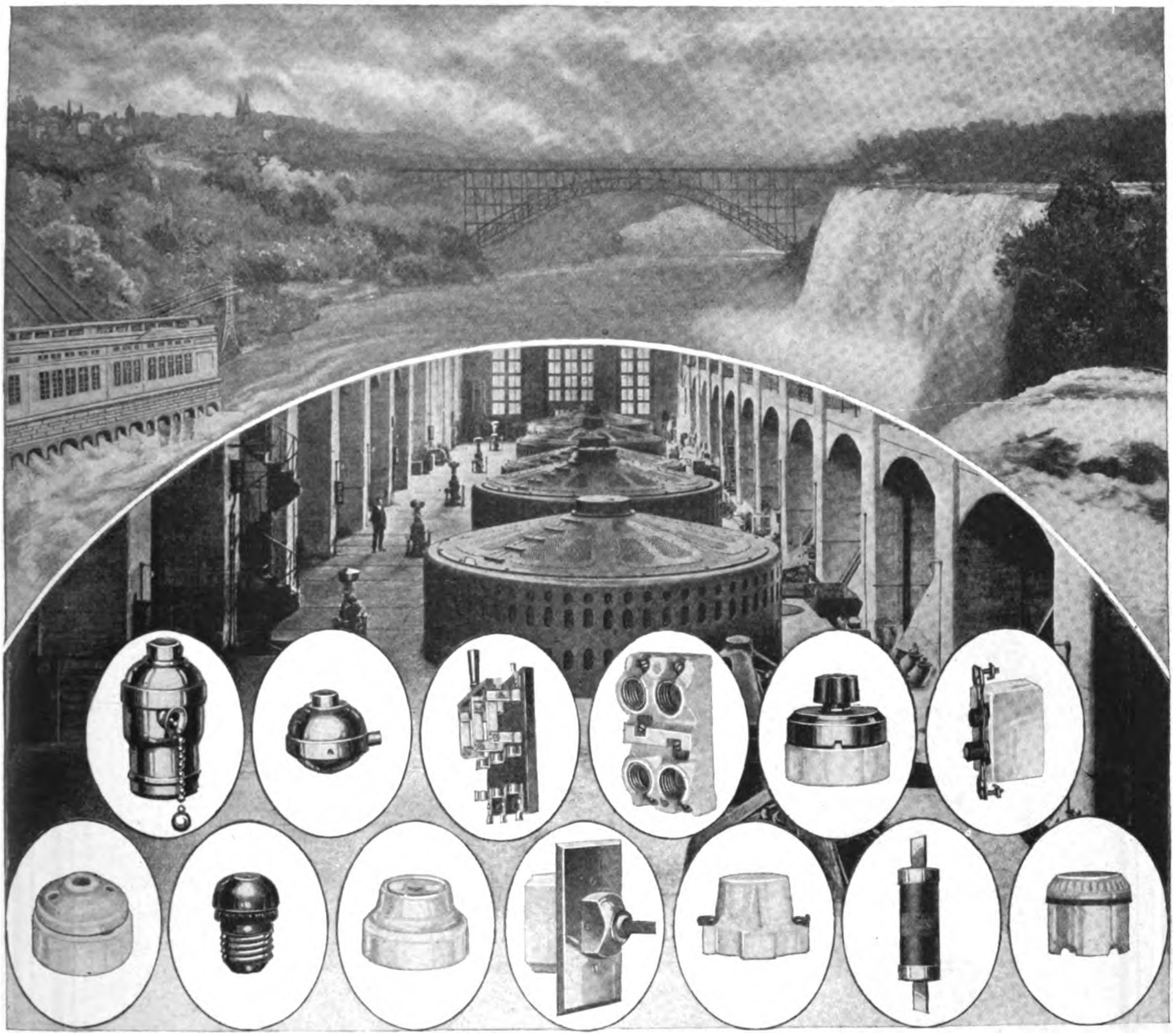
This lamp is supplied also in 24 candle-power size, 1½ amperes for 12-14 volt circuits. The 6-7 volt lamp lists at $.35 and the 12-14 volt lamp at $.37.

5518

EDISON LAMP WORKS
OF GENERAL ELECTRIC COMPANY
General Sales Office, Harrison, N. J. Agencies Everywhere

This symbol on all Edison Mazda Cartons

Guarantee of Excellence on Goods Electrical



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Generation and transmission of power often involve the expenditure of millions of dollars.

This power must ultimately be applied by means of wiring devices of relatively insignificant cost.

If the wiring devices prove inefficient, the purpose for which the millions were spent is not fulfilled—the moral is obvious.

G-E Reliable Wiring Devices are for sale by distributors in all large cities

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Portland, Ore.
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Salt Lake City, Utah.
San Francisco, Cal.
Schenectady, N. Y.
Seattle, Wash.
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Toledo, Ohio
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For Texas, Oklahoma and Arizona business refer to Southwest General Electric Company (formerly Hobson Electric Co.), Dallas. El Paso, Houston and Oklahoma City. For Canadian business refer to Canadian General Electric Company, Lt'd, Toronto, Ont. 5434

"Concentrated Accuracy"

Fittingly Describes the

Weston

MINIATURE PRECISION INSTRUMENTS

For Direct Current

MODEL 267
Switchboard Ammeter

The same degree of mechanical and electrical excellence which has won pre-eminence for the larger Weston Models, is embodied in these wonderful little masterpieces of the instrument maker's art. The finest watch is a less striking example of perfection in delicate workmanship. They are accurate, dead-beat, extremely sensitive. They are shielded against external electrical and magnetic influences. Despite their great refinement in workmanship they are very substantially constructed and have the longest scale ever provided in instruments of similar size. In short, they are the finest development of small instruments of the pivoted moving coil, permanent magnet type. And the prices are low.

MODEL 280
Triple Range Portable Volt-Ammeter

The group includes Portable Volt-Meters, Milli-voltmeters, Volt-Ammeters, Ammeters, Mil-Ammeters in single, double and triple ranges; Battery Testers and Switchboard Voltmeters, Volt-Ammeters, Ammeters and Mil-Ammeters. The several models and ranges offer a selection from over 300 different combinations. The switchboard instruments are listed in bulletin No. 20 and portable instruments in bulletin 501. They will be mailed on request.

Weston Electrical Instrument Co.
43 Weston Ave., Newark, N. J.

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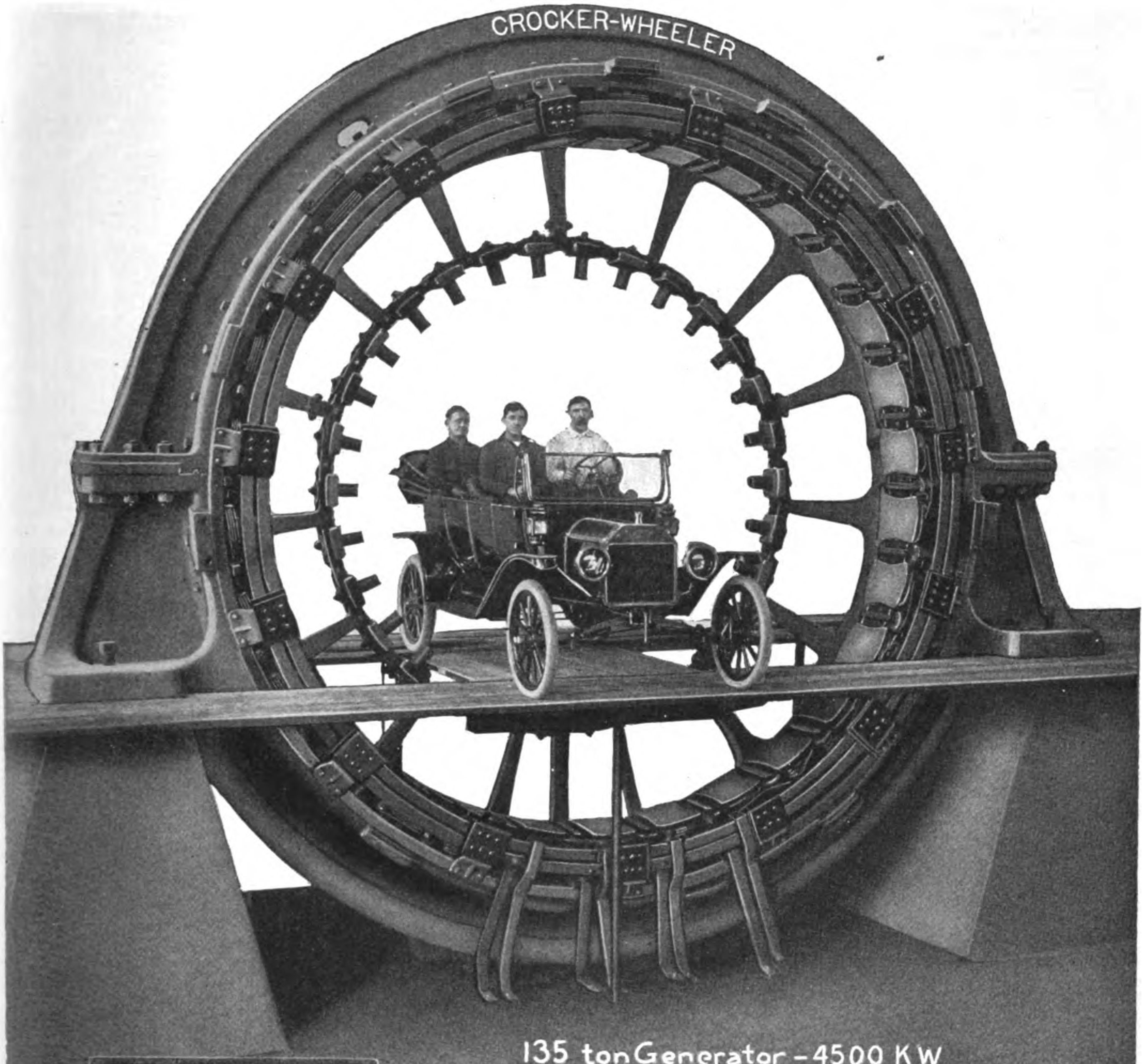

135 ton Generator - 4500 KW one of four recently delivered to Ford Motor Co. Detroit.

1/20 H.P. Crocker-Wheeler Motor

Comparative size of Generator to a Ford Automobile is shown above.

Crocker-Wheeler Unique Facts

C-W Size

CROCKER-WHEELER COMPANY TRADE MARK

The Crocker-Wheeler Company is not so large that the smallest order for electrical machinery will not receive its most careful attention.

Yet it is not so small that the very largest order for the very largest equipment will not be handled.

It manufactures all kinds and sizes of electrical machinery and is equipped to build generators, motors and transformers from the smallest to the largest capacity.

Crocker-Wheeler Co.
Ampere, N. J.
Offices Everywhere
Manufacturers of Electric Motors
Generators and Transformers.

2388

Bailey & Co., Amesbury, Mass.
Baker Motor Vehicle Co., Cleveland.
Beaver Motor Truck Co., Portland, Ore.
Capitol Truck Co., Denver, Colo.
Century Elec. Car Co., Detroit, Mich.
Champion Wagon Co., Oswego, N. Y. (Commercial Vehicles).
Chase Motor Truck Co., Syracuse, N. Y. (Repair Wagons).
Cleveland Galion Motor Truck Co., Cleveland, O.
Columbian Elec. Vehicle Co., Detroit.
Commercial Truck Co. of Am., Phila.
Couple-Gear Co., Grand Rapids, Mich. (Commercial Vehicles).
Cowan Truck Co., Holyoke, Mass. (Trucks).
Cyco-Electric Car Co., New York.
Dayton Elec. Car Co., Dayton, O.
Dey Elec. Vehicle Syndicate, New York.
Elec. Vehicle Ass'n of America, N. Y.
Electriquette Mfg. Co., Los Angeles, Cal., "Osborn" Chair.
Elwell-Parker Elec. Co., Cleveland, O. (Trucks).
Empire El. Veh. Co., Oswego, N. Y.
Field Elec. Bus Co., New York.
Fritchle Auto & Bat. Co., Denver.
Galion (O.) Dynamic Motor Truck Co. (Trucks).
Gas-Electric Motorbus Corp., New York (Gas-Electric Buses).
Gen. Motors Truck Co., Pontiac, Mich.
General Vehicle Co., Long Island City, N. Y. (Commercial Vehicles).
Grinnell Elec. Car Co., Detroit.
Healey & Co., New York, N. Y.
Hoagland-Thayer, Inc., Newark, N. J. (Platform trucks).
Holt-Chandler, New York, N. Y.
Hunt Co., C. W., West New Brighton, N. Y. (Trucks).
Kentucky Wagon Mfg. Co., Louisville, Ky.
Klingelsmith Elec. Truck Co., Chicago.
Lansing Co., Lansing, Mich. (Trucks).
M. & P. Elec. Vehicle Co., Detroit.
Mercury Mfg. Co., Chicago, Ill. (Tractors).
Milburn Wagon Co., Toledo, O.
Ohio Elec. Car Co., Toledo, O. (Busses).
Rauch & Lang Carriage Co., Cleveland, O.
R. C. H. Corporation, Detroit, Mich.
Standard El. Car Co., Jackson, Mich.
Stetson-Ross Machine Wks., Seattle, Wash. (Trucks).
Walker Vehicle Co., Chicago, Ill., "Chicago."
Ward Motor Vehicle Co., Mt. Vernon, N. Y.
Waverly Co., Indianapolis, Ind.
Woods Motor Vehicle Co., Chicago.

BABY KNIFE SWITCHES.
See Switches, Baby Knife.

BAGS, Belts, Straps.

Tool Bags—Linemen's Belts—Carbon Bags—Jackstraps.

Aschenbach Harness Co., Henry, N. Y.
Boyle & Co., John, New York.
Dicke Tool Co., Downers Grove, Ill.
Excelsior Bag Mfg. Co., Troy, N. Y.
Fesser Co., F. S., Indianapolis, Ind.
Galewski & Son, New York, N. Y.
Kennedy Mfg. Co., Chicago, Ill.
Klein & Sons, Mathias, Chicago., Ill., "Multiuse."
Meckel, Fred L., Chicago, Ill.

BAKERS' MACHINERY.

Names of manufacturers of motor driven bakers' machinery will be furnished on request by the Gage Publishing Co., 114 Liberty st. New York.

BAKERY OVENS. See Cooking.
BALCONIES—See Platforms, Pole.
BANKS, TOYS. See Toys.
BARBER POLES.
See Poles, Barber.

BARS, Commutator.

Commutator & Bus Bars.

CAMERON ELECTRICAL MFG. CO., Ansonia, Conn.
Eureka Co., North East, Pa.
Forest City Elec. Co., Cleveland, O.
Rome (N. Y.) Brass & Copper Co.

BASES, READING LAMP.
See Pottery Bases for Lamps.

BASES, Snap Switch.

BRYANT ELEC. CO., Bridgeport, Ct.
HART & HEGEMAN MFG. CO., Hartford, Conn.
PASS & SEYMOUR, Solvay, N. Y.
Colgan Co., Wm. H., West Newton, Mass., "Rex."

BASES, SWITCH, WOOD.
See Blocks, Wood.

BASES, Trolley.

GENERAL ELECTRIC CO., Schenectady, N. Y.

Bayonet Trolley Harp Co., Springfield, Ohio.
Detroit Trolley & Mfg. Co., Detroit.
Fixler Trolley Stand Co., Delta, O.
Holland Trolley Supply Co., Cleveland, Ohio.
Lord Mfg. Co., Brooklyn, N. Y., "Sterling."
Nuttall Co., Pittsburgh, Pa.
Recording Fare Register Co., New Haven, Conn., "Kelsey."
Trolley Supply Co., Canton, Ohio, "Canton," "National," "Peerless."

BATH CABINETS.
See Cabinets, Bath Light.
BATH HEATERS.
See Heaters, Liquid.
BATTERIES, BLASTING.
See Blasting.

BATTERIES, Dry.

AMERICAN EVER READY WKS. OF NAT'L CARBON CO., Long Island City, N. Y., "Everready."
BEACON MINIATURE ELEC. CO., 118 Duane st., New York, N. Y., "Aladdin."
BRIGHT STAR BATTERY CO., 428 West 14th st., New York, "Mars," "Mars-Bright."
BUNNELL & CO., J. H., 32 Park pl., New York, N. Y., "Standard," "Mascot," "Jove."
IMPORT SALES CO., 19 E. 21st st., New York (Imp. "Diamond").
INTERSTATE ELECTRIC NOVELTY CO., 29 Park pl., New York, "Franco."
MANHATTAN ELEC'L SUPPLY CO., 17 Park pl., New York, "Mesco," "Red Seal," "Hi-Up," "Blue Seal."
NUNGESSER CARBON & BATTERY CO., Cleveland, O., "1900," "Acme Rapid Fire."
STANLEY & PATTERSON, 23 Murray st., New York ("Patterson" & "Exeter" Battery Sets).
ROKA BATTERY CO., 19 East 21st st., New York, N. Y.
USONA MFG. CO., 1 Hudson st., New York, N. Y. "Kwik-Lite."
WILHELM H., 70 Frost st., Brooklyn, N. Y., "Helm."

American Carbon & Battery Co., East St. Louis, Ill.
Broue Elec. Co., Pittsburgh, Pa. (Refillable).
Burn-Boston Battery & Mfg. Works, Boston, Mass., "Add Water."
Champion Carbon Co., Cincinnati, O.
Delta Mfg. Co., Newark, N. J.
French Battery & Carbon Co., Madison, Wis., "Fleur de Lis."
Harper, F. D., Everett, Mass., "Secret Service," "Masda," "Flashlight.
Hi-Po Waterproof Battery Co., Brooklyn, N. Y.
Hopple Elec. Co., Lawndale, Cal.
National Carbon Co., Cleveland, O., "Columbia," "Stand-By," "Globe," "Red Top," "New Century," "Atlantic," "U. S. Naval Reserve."
Roche Elecl. Co., Wm., New York, "New Standard," "Yates."
Stackpole Carbon Co., St. Mary's, Pa., "Autocrat," "Wizard," "Hello," "Sure," "X-Ray," "Elk."
Standard Carbon Co., Los Angeles, Cal., "Western."
Tardle, E. J., New York, "Leader," "Improved."
Union Battery Co., Belleville, N. J., "Power," "Nue."
U. S. Auto Battery Co., New York, "Readyspark," "Topnotch."
Universal Carbon Co., Dundee, Ill.
Western Dry Battery Co., Seattle.
White Star Battery Co., New York, "Red Star," "White Star."

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BUNNELL & CO., J. H., 32 Park pl., New York, N. Y., "Auto-Kure."
MANHATTAN ELECTRICAL SUPPLY CO., 17 Park pl., New York, "Anti-Doc," "Home," "Apollo," "Household."
MENOMINEE ELEC. MFG. CO., Menominee, Mich.
STANLEY & PATTERSON, 23 Murray st., New York, "Electrotonic," "Davis & Kidder."

Betz Co., Frank S., Chicago, Ill.
Chloride of Silver Dry Cell Battery Co., Baltimore, Md.
Detroit (Mich.) Medical Battery Co.
Electro-Therapeutic Mfg. Co., Indianapolis, Ind.
Ford & Co., W. F., New York.
Otto Mfg. Co., Jersey City, N. J., "Climax."
Pullen Co., Leon W., Philadelphia, "Gal-Far."
Sence & Son, L., New York.
Wallman Mfg. Co., Jersey City, N. J.
Whitall, Tatum & Co., Philadelphia, "Florence."
Williams Electro Medical Battery Co., New York.

BATTERIES, Storage.

Portable, Ignition, Testing, Light, Power.

AMERICAN BATTERY CO., 1162 Fulton st., Chicago.
AMERICAN EVER READY WKS. OF NAT'L CARBON CO., Long Island City, N. Y.
EDISON STORAGE BATTERY CO., 107 Lakeside ave., Orange, N. J.
JEWEL ELEC. CO., Dept. G., 732 Sherman st., Chicago, Ill.
ROKA BATTERY CO., 19 E. 21st st., New York.

A. B. Mfg. Co., Poughkeepsie, N. Y.
Ajax Battery Co., Chicago.
American Storage Battery Co., Cambridge, Mass., "Harvard."
Ampro Battery Co., Chicago, Ill.
Ashbrook, J. F., Chicago, "Squires."
Bison Storage Battery Co., Buffalo.
Brown-Smith Battery Co., Bloomington, Ind.
Commercial Battery Co., Chicago, "Combat."
Dayton Elec'l Mfg. Co., Dayton, "Hubler-Dayton."
Eastern Battery Co., Pawtucket, R. I.
Electric Storage Battery Co., Philadelphia, "Exide," "Tudor," "Standby," "Hycap-Exide," "Hyray," "Chloride," "Ironclad."
Electric Storage Supply Co., Boston, "Speed."
Electro Importing Co., New York City.
Esser, John F., New York, "E. O."
Essex Storage Battery & Supply Co., Newark, N. J.
Gardiner Storage Battery Co., Chicago, Ill.
General Lead Batteries Co., Newark, N. J.
Globe Elec. Co., Wilwaukee, Wis.
Gould Storage Battery Co., New York.
Guaranteed Elec. Storage Battery Co., St. Louis, "Atlas."
Heissler Storage Bat. Co., Chicago.
Hirsch Elec. Mine Lamp Co., Phila.
Hoosier Storage Battery Co., Evansville, Ind., "Fire Fly," "Hobo."
Kinetic Elec. Co., Norfolk, Va.
Keener Accumulator Industry, Chicago.
Lemke El. Co., Wilwaukee, "L. B."
L. C. R. Storage Bat. Co., Dayton, O.
Lawrence Storage Battery Co., Cleveland, O.
McCauley Storage Battery Co., Cleveland, O., "Kremlo."
MacRae, Hector, Baltimore, Md., "Champion."
Marcuson, E., New York ("Witham" Testing Battery.
Marko & Co., Paul, Brooklyn.
Michigan Storage Battery Co., Detroit.
Miller Storage Battery Co., Toledo.
Milwaukee Auto Specialty Co., Milwaukee, Wis., "Radium," "Victor," "Masco."
Monarch Battery Co., Chicago, Ill.
Muller, Albert, Jamaica, L. I., N. Y., "Porox."
Multiple Storage Battery Co., N. Y.
National Carbon Co., Cleveland, O., "Helios."
New England Battery Co., Pawtucket.
Northwestern Storage Battery Co., Milwaukee.
Perfection Storage Bat. Co., Chicago.
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Philadelphia Storage Battery Co., Phila., Pa., "Diamond Grid."
Pumpelly Battery Co., Indianapolis.
Rex Battery Co., Chicago.
Schug Electric Mfg. Co., Detroit.
Silvey Elec. Co., Dayton, O.
St. Joseph's Battery Co., St. Joseph, Mo., "Dalite."
Storage Battery Co. of Am., Chicago, Ill., "Re-Viv-O."
Storage Battery Supply Co., N. Y.
United States Light & Htg. Co., Niagara Falls, N. Y., "Unit," "National."
Universal Battery Co., Chicago.
Vesta Accumulator Co., Chicago.
Victor Storage Battery Co., Rock Island, Ill., "S. O. S."
Vivax Storage Battery Co., Chicago, Ill., "Duro."
Volkcar Storage Bat. Co., Chicago, Ill., "Expo."
Weber Battery Mfg. Co., Chicago, Ill.
Willard Storage Battery Co., Cleveland, O., "Annex," "Elba."
Witherbee Ign. Co., Springfield, Mass.

BATTERIES, Wet.

Open and Closed Circuit.

MANHATTAN ELECTRICAL SUPPLY CO., 17 Park pl., New York.

American Carbon & Battery Co., East St. Louis, Ill.
Clark & Mills Elec. Co., Cambridge, Mass. ("Excello" Closed Circuit).
Edison, Inc., Thos. A., Orange, N. J. (BSCO" Closed Circuit).
Gordon Primary Battery Co., N. Y.
Leclanche Battery Co., New York, "Axo," "Gonda."
Maxivolt Primary Battery Co., N. Y.
National Carbon Co., Cleveland, O., "Klondike," "Duplex," "Columbia." "Trojan."
Samson Elec. Co., Canton, Mass.
Waterbury Battery Co., Waterbury, ("Schoenmehl," Closed Circuit).
White Dental Mfg. Co., S. S., Philadelphia, "Partz."

BATTERY CHARGING.
See Charging Outfits.
BATTERY GAUGES.
See Instruments, Pocket.
BATTERY MOTORS. See Toys.
BATTERY PARTS.
See Specific Article.
BAYONET SOCKETS & CONNECTORS—See Sockets, Ediswan.
BEADS, GLASS. See Crystals.
BEAM CLAMPS.
See Hangers and Clamps.
BEARINGS, INSTRUMENT.
See Jewels, Instrument Bearing.
BED CLAMP PORTABLES.
See Clamps, Lamp Attaching.
BELLS, AUTOMOBILE.
See Horns, Elec..
BELL ENDS.
See Fitings, High Tension.
BELL RINGERS.
See Transformers, L. V.

BELLS, Electric.

Bells—Electro-Mechanical Gongs—Buzzers—Crossing Bells—Fire Alarms.

ANSONIA ELECTRICAL CO., Ansonia, Conn., "Eureka," "Wizard," "Acme."
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CONNECTICUT TELE. & ELEC. CO., Meriden, Conn.
EDWARDS & CO., New York, "Lungen," "Vigilant," "Auto-Recti," "Eco," "Cadet," "R. E. A. L.," "Riot" Motor Driven Bell, "Recti."
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GAMEWELL FIRE ALARM TELEGRAPH CO., Newton Upper Falls, Mass.
HOLTZER-CABOT ELECTRIC CO., Brookline, Mass., "Hub-Dome."
MANHATTAN ELECTRICAL SUPPLY CO., 17 Park pl., New York, "Nonpareil," "Utility," "Crescent," "Imperial," "Crescendo," "Monarch," "Monitor," "Peerless," "Premier."
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OSTRANDER & CO., W. R., 22 Dey st., New York.
PARTRICK & WILKINS CO., Philadelphia, Pa.
P. R. MFG. CO., 621 Bellevue ave., Detroit, Mich., "Rex," "Mario," "XXX," "Eclipse," "Ekla," "Straight Line."
SCHWARZE ELECTRIC CO., Adrian, Mich., "Universal," "Cyclone."
STANLEY & PATTERSON, 23 Murray st., New York, "Faraday," "Competition," "Globe," "Columbia," "Liberty."

Bryant Zinc Co., Chicago, Ill.
Chicago (Ill.) Ry. Signal & Sup. Co.
Clemens & Co., J. G., Buffalo, N. Y., "A-C-Buzzers."
Empire Transformer Co., Chicago, Ill.
Haas Elec. & Mfg. Co., R., Springfield, Ill. ("Ideal" Alternating Gong).
Keil & Son, Francis, New York, "Reliance," "Ampro."
New Departure Mfg. Co., Bristol, Conn. (For Fire Engine Ambulances and Patrols).
Pearce Co., Frederick, New York.
Railroad Supply Co., Chicago, Ill.
Russell Electric Co., Danbury, Conn., "Mono-Seal."
Samson Elec. Co., Canton, Mass., "Dandy," "Tyrolean," "Star."
Searles Elec. Co., Chicago, "Smith."
Standard Elec. Utilities Co., New York, N. Y., "Buzzbell."
Star Electric Co., Newark, N. J.

BELLS, MAGNETO & EXTENSION. See Telephones.
BELLS, ST. CAR. See Gongs.
BELTS.—See Bags, Belts, Straps.

BENCHES, Vise (Portable).

Em. Em. Selling Co., New York.

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AUSTIN & CO., M. B., 700 Jackson blvd., Chicago, Ill., "Dandy," "Rex," "Anthony," "Boss."
RITTENHOUSE CO., A. E., Honeoye Falls, N. Y.
ROBERTS ELEC. SUPPLY CO., H. C., 905 Arch st., Philadelphia, "Victor."
STEEL CITY ELECTRIC CO., 1207 Columbus ave., Pittsburgh, Pa., "Fullman."
THOMAS & BETTS, 103 Hudson st., New York, "Standard," "Lakin."

Chicago Pneumatic Tool Co., Chicago, "Little Giant."
Cox & Co., J. Fillmore, Bayonne, N. J. (Universal Bending Mach.).
Martin & Sons, H. P., Owensboro, Ky.
Minnesota Electric Co., Minneapolis.
Vanderman Mfg. Co., Willimantic, Ct.
Wrigley Co., Thomas, Chicago, Ill.

BENDERS, Metal Moulding.

Whiteley, Alfred, New York, N. Y., "Bendo."

BENDERS, Tubing.

Fixture Tubing.

Cox & Co., J. F., Bayonne, N. J.
Tube Bending & Polishing Machine Co., Baltimore, Md.

BENDING MACHINES.
See Machines, Steel Bending.
BICYCLE LAMPS.
See Lamps, Auto.
BINDING POSTS.
See Posts, Binding.
BITS.—See Drills and Bits.
BLANKETS, WARMING.
See Pads, Heating.

BLASTING APPARATUS.

Batteries—Magnetos—Fuses—Cables—Caps.

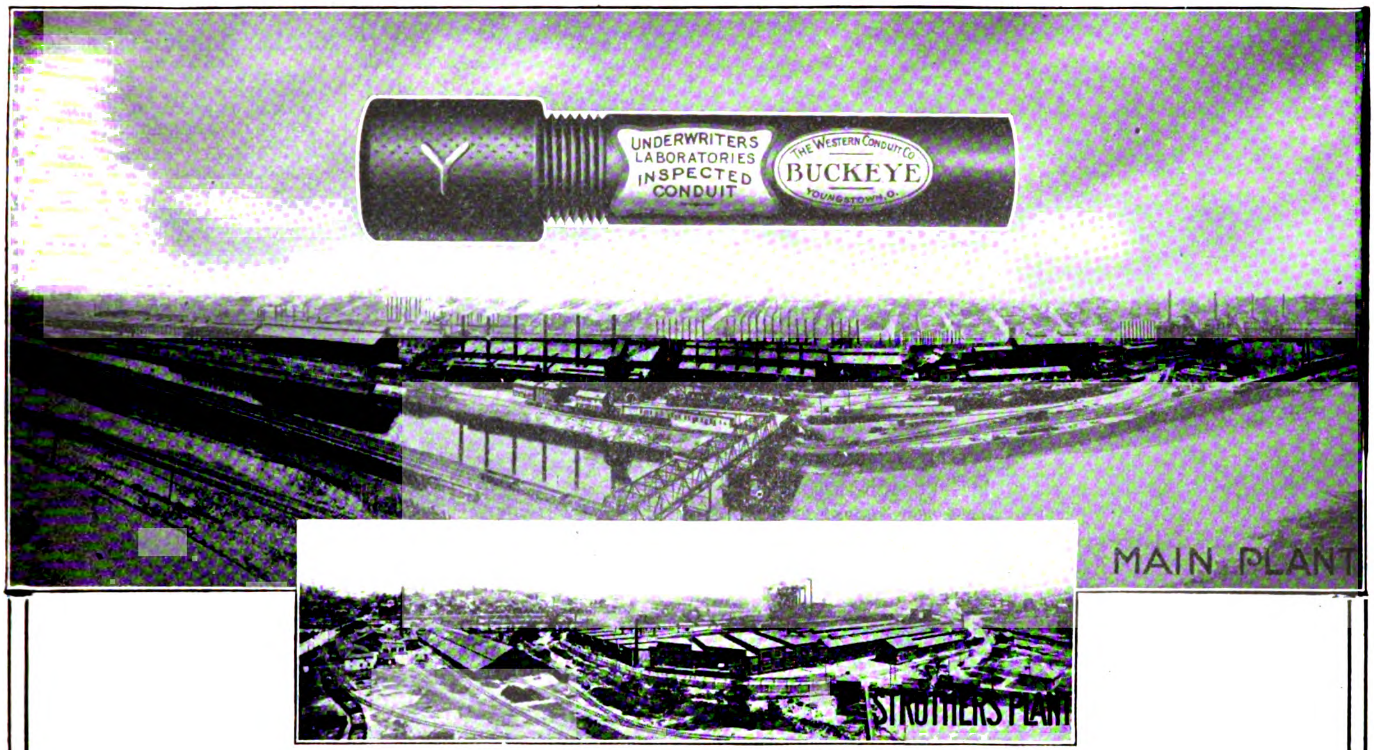
Aetna Powder Co., Chicago, "Lyon."
Dupont de Nemours Powder Co., E. I., Wilmington, Del., "Victor," "Pull Up," "U. S. Standard."
Star Elec. Fuse Wks., Wilkes-Barre, Pa., "Lilliput," "Push Down."

BLOCKS, Wood.

Fixture Blocks or Wall Plates, also Battery Switch or Cut-Out, Bases or Mats.

Benner Mfg. Co., Lancaster, Pa.
Fuller, J. J., Westfield, Mass.

BLOCKS, FUSE—See Cut-Outs.
BLOCKS, HAT CLEANERS'.
See Cleaners, Hat.
BLOCKS, METER TESTING.
See Boxes, Meter Protector.



"Buckeye" Conduit and "Realflex" Armored Conductors Are Made Here

As a matter of good business consider these facts about "BUCKEYE" RIGID CONDUIT and "REALFLEX" ARMORED CONDUCTORS.

We are one of the largest manufacturers of conduit and flexible conductors in the world.

Our organization is complete in every detail inasmuch as we manufacture all of our finished products straight through from the ore.

In addition to these facts each successive step in their manufacture, from the ore, is made under the direct supervision of our staff of experienced engineers and recognized steel experts.

We consequently know our products from start to finish. They are honestly made. Our business reputation stands behind that statement and is your guarantee.

The
Western Conduit Co.
Youngstown, Ohio.
Subsidiary to
The Youngstown Sheet & Tube Co.

BLOCKS, Moulding.

For Wooden Moulding—Blocks—Boxes—Fittings—Splice Protectors—Kickplates.

JORDAN BROS., 74 Beekman st., New York (Splice Protectors).
PAISTE CO., H. T. (Hart & Hegeman Mfg. Co., Hartford, Conn., Exclusive Selling Agents), "P. K. Taplets."
PHELPS, JAMES C., Springfield, Mass. ("J. C. P." Molding Boxes).
TRUMBULL ELECTRIC MFG. CO., Plainville, Conn. ("H. & M." Branch Blocks).
Colgan Co., Wm. H., West Newton, Mass., "Rex."
Fancleve Specialty Co., Boston, Mass.
Gillette-Vibber Co., New London, Conn. ("G. V." Universal).
Greater N. Y. Metal Box Co., New York (Kick Plates).
Iron Specialty Co., New York.
Nicolay, W. H., Brooklyn, N. Y., "Model" Kickplates.
Schwartz & Bro., S., Robert, New York ("Ementap" Branch Blocks).

BLOCKS, Pulley, Linemen's.

Burr Mfg. Co., Cleveland, Ohio.
Dicke Tool Co., Downers Grove, Ill.
Klein & Sons, Mathias, Chicago, Ill., "Walton."
Laurent-Cherry Pulley Block Co., Trenton, N. J.

BLOCKS, TERMINAL.
See Fittings, High Tension.

BLOWERS, Organ.

(Motor Driven)

Kilgon & Sons, George, St. Louis.
Kimble Electric Co., Chicago.
Kinetic Engineering Co., Philadelphia.
Organ Power Co., Hartford, Conn., "Orgoblo."

BLUE PRINTING, Elecl.

Buckeye Engine Co., Salem, Ohio.
Elliott Co., B. K., Pittsburgh, Pa.
Herman & Sons, R., Pittsburgh.
Keuffel & Esser Co., Hoboken, N. J., "Federal," "Champion."
Paragon Mch. Co., Rochester, N. Y.
Pease Co., C. F., Chicago ("Peerless" Cutting and Trimming Table).
Revolute Machine Co., New York, "Everett, "Mc Adam."
Shaw Blue Print Machine Co., Newark, N. J.
Toerring Co., C. J., Philadelphia, Pa.
Wagenhorst & Co., Youngstown, O.
Williams, Brown & Earle, Philadelphia, "Franklin," "Express."

BLUESTONE.
See Chemicals, Battery.

BOILERS, Electric.

Barber Shop, Kitchen Range.

Cutler El. Htg. Co., San Francisco.
Simplex Electric Heating Co., Cambridge, Mass.

BOLT CLIPPERS.
See Clippers, Bolt.

BOLTS, Expansion.

Bolts, Sleeves, Plugs.

HUBBARD & CO., Pittsburgh, Pa., "Peirce."
ST. LOUIS MALLEABLE CASTING CO., 7777 N. Conduit ave., St. Louis, Mo.
American Expansion Bolt Co., N. Y.
Ankyra Mfg. Co., Wayne Junction, Philadelphia, Pa. (Anchor Bolts).
Brohard Co., Philadelphia, "Climax."
Cameron Appliance Co., Everett, Mass. (Plugs).
Cinch Expansion Bolt & Engineering Co., New York.
Chicago Nut Co., Chicago, "Ajax."
Church, Isaac, South Norwalk, Conn., "O. K.," "Perfect," "Duplex."
Diamond Expansion Bolt Co., New York, "Diamond," "Keystone."
Evans, F. H., Brooklyn, "Crescent."
Farrington, H., New York.
Fee & Mason, New York.
Garrison Brass & Machine Works, New York, "Phillips."
Gebhardt Expansion Bolt Co., Richmond, Va.
Klein & Sons, Mathias, Chicago, Ill., "Standard."
McCabe Hanger Mfg. Co., New York.
New England Bolt & Steel Co., Everett, Mass.
Osborne, H. G., Brooklyn, "Boone."
Paine Co., Chicago.
Parker Supply Co., New York, N. Y.
Richmond Screw Anchor Co., N. Y.
Seaman & Co., A. C., Philadelphia, "Positive."
Star Expansion Bolt Co., New York, "Sebco."
Stannard Mfg. Co., Springfield, Mass., "Little Giant."
Steward & Romaine Mfg. Co., Philadelphia, Pa., "Ahlstrom."
U. S. Expansion Bolt Co., New York.
Van Expansion Bolt Mfg. Co., Chicago, Ill.

BOLTS, Lag.

LANZ & SONS, M., Pittsburgh, Pa.
ST. LOUIS MALLEABLE CASTING CO., 7777 N. Conduit ave., St. Louis, Mo.
Line Material Co., S. Milwaukee, Wis.
New England Bolt & Steel Co., Everett, Mass.
Oliver Iron & Steel Co., Pittsburgh.

BOLTS, Toggle.

CUTTER CO., GEO., 411 Notre Dame st., South Bend, Ind., "Lever."
McGILL MFG. CO., 39 Oak st., Valparaiso, Ind., "Crescent."
SORENSEN, P., 14 Dunham pl., Brooklyn, N. Y.
WALDMAN, JOHN J., 136 Liberty st., New York.
Chicago Nut Co., Chicago, "Ajax."
Conlan Electric Co., New York ("Jencoco" Toggle Strap).
Diamond Exp. Bolt Co., New York.
Garrison Brass & Mch. Wks., New York, "Heiland."
Paine Co., Chicago, Ill.
Star Expansion Bolt Co., New York.
U. S. Expansion Bolt Co., New York.
Wrigley Co., T., Chicago.

BONDING PUNCHES.
See Punches, Rail Bonding.

BONDS, Rail.

AMERICAN STEEL & WIRE CO., Chicago, Ill., "Crown," "Chicago," "United States."
CONDIT ELEC. MFG. CO., Boston, "Shawmut."
GENERAL ELEC. CO., Schenectady, N. Y.
Brown, Harold P., New York, "Edison-Brown."
Clark Electric & Mfg. Co., New York.
Electric Ry. Improvement Co., Cleveland, O. (Elec. Bonding Outfit).
Electric Service Supplies Co., Philadelphia, Pa., "Protected."
Jaimson Rail Bond & Elec'l Supply Co., Pittsburgh, Pa.
Johns-Manville Co., H. W., New York.
Lord Mfg. Co., Brooklyn, N. Y., "Laminated," "Oregon."
Ohio Brass Co., Mansfield, O.
Roebling's Sons Co., Trenton, N. J.

BOOKS.

WIRING DIAGRAM PUBLISHING CO., 336 W. Van Buren st., Chicago, Ill.

BOOSTERS.—See Motor-Generators.

BOOTHS, Telephone.

Acme Cabinet Co., New York.
Brownell, C. H., Peru, Ind.
Folding Cabinet Co., Lancaster, Pa., "Altick."
French Cabinet Co., Brooklyn.
Home Equip. Co., Pleasanton, Kans.
Miniature Tel. Booth Co., New York (Desk Booth).
Seaman & Co., W. S., Milwaukee.
Yesbera Mfg. Co., Toledo, O.

BORING TOOLS—See Tools, Boring; also Tools, Portable.

BOWLS, GLASS.
See Shades, Glass.

BOWLS, Marble & Alabaster

SCHAFFER CO., MAX, 26 Warren st., New York, N. Y. (Imp.).
Bing & Co., Ferdinand, New York.
Beach & Co., L. D., New York, N. Y.
Canini, I. E., Chicago, Ill.
Fischer & Jirouch Co., Cleveland, O. (Plaster and Composition).
Koscherak Bros., New York (Imp.).
Milwaukee (Wis.) Ornamental Carving Co.
Pairpoint Corp., New Bedford, Mass.

BOX CONNECTORS.
See Fittings, Conduit.

BOXES, BATTERY.
See Holders, Battery.

BOXES, Cast Iron

Without Fittings, Empty.

ADAM ELECTRIC CO., FRANK, St. Louis, Mo.
BISSELL CO., F., Toledo, O., "Security."
BRADY ELECTRIC MFG. CO., New Britain, Conn.
BRYANT ELECTRIC CO., Bridgeport, Conn.
CONNECTICUT ELECTRIC MFG. CO., Conecticut and Florence aves., Bridgeport, Conn.
CROUSE-HINDS CO., Syracuse, N. Y.
D. & W. FUSE CO., Providence, R. I.
DETROIT FUSE MFG. CO., 1411 Rivard st., Detroit, Mich.
METROPOLITAN ELEC. MFG. CO., 14th st. and East ave., Long Island City, N. Y.
MORRIS, ELMER P., 136 Liberty st., New York, N. Y.
RENIM SPECIALTY CO., Brighton Station, Boston, Mass.
TRUMBULL ELECTRIC MFG. CO., Plainville, Conn.
WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa.
Bonnell Co., W. A., New York.
Burns, James F., Philadelphia, Pa., "Readytouse."
Greater New York Metal Box Co., New York, N. Y.
Johns-Manville Co., H. W., New York, "Noark."
Krantz Mfg. Co., Brooklyn, N. Y.
Mutual Electric & Machine Co., Wheeling, W. Va.
Service Elec. & Mfg. Co., Minneapolis.
Troy Elec'l Co., Troy, N. Y., "Teco."
V. V. Fittings Co., Philadelphia, Pa.

BOXES, Conduit.

Outlet—Junction—Rotary or Push Switch.

APPLETON ELEC. CO., 212 N. Jefferson st., Chicago, "Unilets."
CHELTEN ELEC. CO., Philadelphia, Pa.
CHICAGO FUSE MFG. CO., Chicago, Ill. ("Union" Sectional), "Gem."
COLUMBIA METAL BOX CO., 226 E. 144th st., New York, N. Y.
CROUSE-HINDS CO., Syracuse, N. Y., "Condulets."
CUTTER CO., Philadelphia ("Munit" Switch Box).
ELECTRIC OPERATIONS CO., Bush Terminal, Brooklyn, N. Y.
GRAVES SWITCH BOX CO., 2190 Stearns Road, Cleveland (Switch).
HART MFG. CO., Hartford, Conn. ("Diamond H" Switch Boxes).
HART & HEGEMAN MFG. CO., Hartford, Conn. (H. & H. Switch Boxes).
L. F. MFG. CO., 80 Fleet st., Jersey City, N. J.
METROPOLITAN ELEC. MFG. CO., 14th st. and East ave., Long Island City, N. Y.
NATIONAL METAL MOULDING CO., 1107 Fulton bldg., Pittsburgh, Pa.
PAISTE CO., H. T. (Hart & Hegeman Mfg. Co., Hartford, Conn., Exclusive Selling Agents), "Pipe Taplets."
RENIM SPECIALTY CO., Brighton Station, Boston.
SPRAGUE ELEC. WKS. OF GENERAL ELEC. CO., 527 W. 34th st., New York, "Multilet."
STAR METAL BOX CO., 173 Hudson st., New York.
STEEL CITY ELECTRIC CO., 1207 Columbus ave., Pittsburgh.
THOMAS & BETTS CO., 103 Hudson st., New York ("T. & B." Cable Boxes), ("Universal" and "Stahley" Outlet Boxes).
TREGONING ELEC. MFG. CO., 416 W. Prospect st., Cleveland, O.
Adapti Mfg. Co., Cleveland, O., "Adaptibox."
Allino Switch Box Mfg. Co., St. Louis, Mo.
Allsteelequip Co., Aurora, Ill.
Berry-Glosser Co., Marion, O.
Bierman-Everett Foundry Co., Irvington, N. J., "Fountain."
Bonnell Co., W. A., New York.
Bossert Co., Utica, N. Y.
Cleveland (O.) Pressed Steel Co. (Switch Boxes).
Colgan Co., Wm. H., West Newton, Mass., "Rex."
Dill Mfg. Co., Cleveland, O.
Duncan Elec. Co., Alton, N. H., "T-B Gem" Outlet Box.
Fancleve Specialty Co., Boston, Mass.
Federal Elec. Co., Pittsburgh, Pa.
Greater New York Metal Box Co., New York, N. Y.
Harvard Elec. Co., Chicago, Ill.
Krantz Mfg. Co., Brooklyn, N. Y. ("De Ryeke" Elevator Box).
Potter Mfg. Co., Cleveland, O.
Pratt Chuck Co., Frankfort, N. Y.
Rice Co., Geo. H., Brooklyn, N. Y.
Standard Elec. Fittings Co., Stamford, Conn.
Sterling Foundry & Machine Co., Newark, N. J., "Meleady."
Troy Elecl. Co., Troy, N. Y., "Teco."
V. V. Fittings Co., Philadelphia, Pa.
Ward, F. H., Brooklyn, N. Y.

BOXES, Floor.

ADAM ELEC. CO., FRANK, St. Louis, Mo.
CUTTER CO., GEORGE, 411 Notre Dame st., South Bend, Ind., "Quixet."
ELECTRIC OPERATIONS CO., Bush Terminal, Brooklyn, N. Y.
FEDERAL SIGN SYSTEM (ELEC.), Lake & Desplaines sts., Chicago, Ill.
MANHATTAN ELECTRICAL SUPPLY CO., 17 Park pl., New York, "Mesco."
OSTRANDER & CO., W. R., 22 Dey st., New York, N. Y.
SPRAGUE ELEC. WKS. OF G. E. CO., 527 W. 34th st., New York.
STANLEY & PATTERSON, 23 Murray st., New York, "Patterson," "Fielding."
STEEL CITY ELECTRIC CO., 1207 Columbus ave., Pittsburgh, Pa., "Fullman."
THOMAS & BETTS CO., 103 Hudson st., New York, "Columbus," "Stahley."
Bonnell Co., W. A., New York.
Conlan Elec. Co., New York.
Krantz Mfg. Co., Brooklyn, N. Y. "Acme," "Gem."
Russell & Stoll Co., New York.
Service Elec. & Mfg. Co., Minneapolis.

BOXES, Letter.

DE VEAU TELEPHONE MFG. CO., 477 18th st., Brooklyn, "Auth."
LOVELL & CO., F. H., Arlington, N. J.
MANHATTAN ELECTRICAL SUPPLY CO., 17 Park pl., New York.
MENOMINEE ELEC. MFG. CO., Menominee, Mich.
OSTRANDER & CO., W. R., 22 Dey st., New York.
WILHELM, H., 70 Frost st., Brooklyn, N. Y.
Couch Co., S. H., Norfolk Downs, Mass.
Electric Apparatus Co., Chicago, Ill.
Keil & Son, Francis, New York.
Leavitt, L., Brooklyn, N. Y.
Samson Elec. Co., Canton, Mass.

BOXES, Manhole (Junction)

With Fittings.

COLUMBIA METAL BOX CO., 226 E. 144th st., New York, N. Y.
D. & W. FUSE CO., Providence, R. I.
GENERAL ELECTRIC CO., Schenectady, N. Y.
STANDARD UNDERGROUND CABLE CO., Pittsburgh, Pa.
G. & W. El. Specialty Co., Chicago.
Johns-Manville Co., H. W., New York.
Metropolitan Engrg. Co., New York.
Ricker Mfg. Co., Rochester, N. Y., "Rochester" Oil Fuse Box.

BOXES, MARINE.
See Fixtures, Marine.

BOXES, Meter Protectors.

Boxes—Blocks.

APPLETON ELECTRIC CO., 212 N. Jefferson st., Chicago, Ill.
DETROIT FUSE & MFG. CO., 1411 Rivard st., Detroit, Mich., "Square D."
GENERAL ELECTRIC CO., Schenectady, N. Y.
PALMER ELEC. & MFG. CO., Franklin and Congress sts., Boston, Mass.
Donley Bros. Co., Cleveland, O.
Metropolitan Engrg. Co., New York.

BOXES, OIL FUSE.
See Boxes, Manhole.

BOXES, SERVICE.
See Boxes, Cast Iron, Boxes Sheet Steel, Also Switches, Combination Cut-Out.

BOXES, SNAP SWITCH.
See Boxes, Conduit.

BOXES, Spark Coil.

STANLEY & PATTERSON, 23 Murray st., New York, "Watertite."
Churchill Cabinet Co., Chicago, Ill.
Household Cabinet Co., Providence.
Standard Cabinet Mfg. Co., Peru, Ind.
Union Hardware Co., Torrington, Ct.
West Box Co., Springfield, Mass.

BOXES, TOLL—See Meter.

BOXES, Tool.

Allsteelequip Co., Aurora, Ill.

BOXES, WATERTIGHT.
See Fixtures, Marine.

BOXES, WOOD.
See Cabinets, Wood.

BOXES & WRAPPERS.

Tungsten Lamp.

Campbell Paper Box Co., So. Bend, Ind.
Continental Paper Bag Co., New York.
Hinde & Dauch Paper Co., Sandusky, Ohio (Wrappers).
Sefton Mfg. Co., Chicago, Ill.

BRACES, Cross Arm.

Braces and Supports.

BISSELL CO., F., Toledo, O., "Security."
HUBBARD & CO., Pittsburgh, Pa., "Peirce."
LANZ & SONS, M., Pittsburgh, Pa.
ST. LOUIS MALLEABLE CASTING CO., 7777 N. Conduit ave., St. Louis, Mo.
American Steel & Iron Mfg. Co., Lebanon, Pa.
Benicia Iron Works, San Francisco.
Buffalo Steel Co., Tonawanda, N. Y.
Cleveland (O.) Galvanizing Wks. Co.
Creaghead Engrg. Co., Cincinnati, O.
Hallett Iron Works, Harvey, Ill., "Steel Gain."
Inland Steel Co., Chicago, Ill.
Line Material Co., So. Milwaukee, Wis.
Meckel, Fred L., Chicago, Ill.
Michigan Bolt & Nut Wks., Detroit.
New England Bolt & Steel Co., Everett, Mass.
Oliver Iron & Steel Co., Pittsburgh.

BRACKETS, AUTO LAMP.
See Adapters, Auto Lamp.

BRACKETS, LAMP—See Fixtures, Adjustable; also Portables; also Clamps, Desk.

BRACKETS, POLE, IRON.
See Pole Line Hardware.

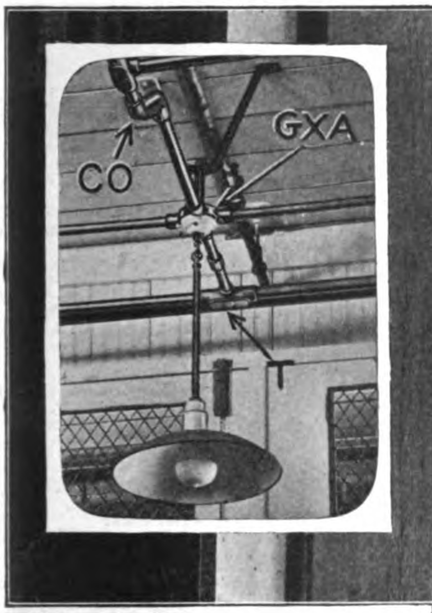
BRACKETS, SAMPLE ROOM LTG.
See Fixtures, Adjustable.

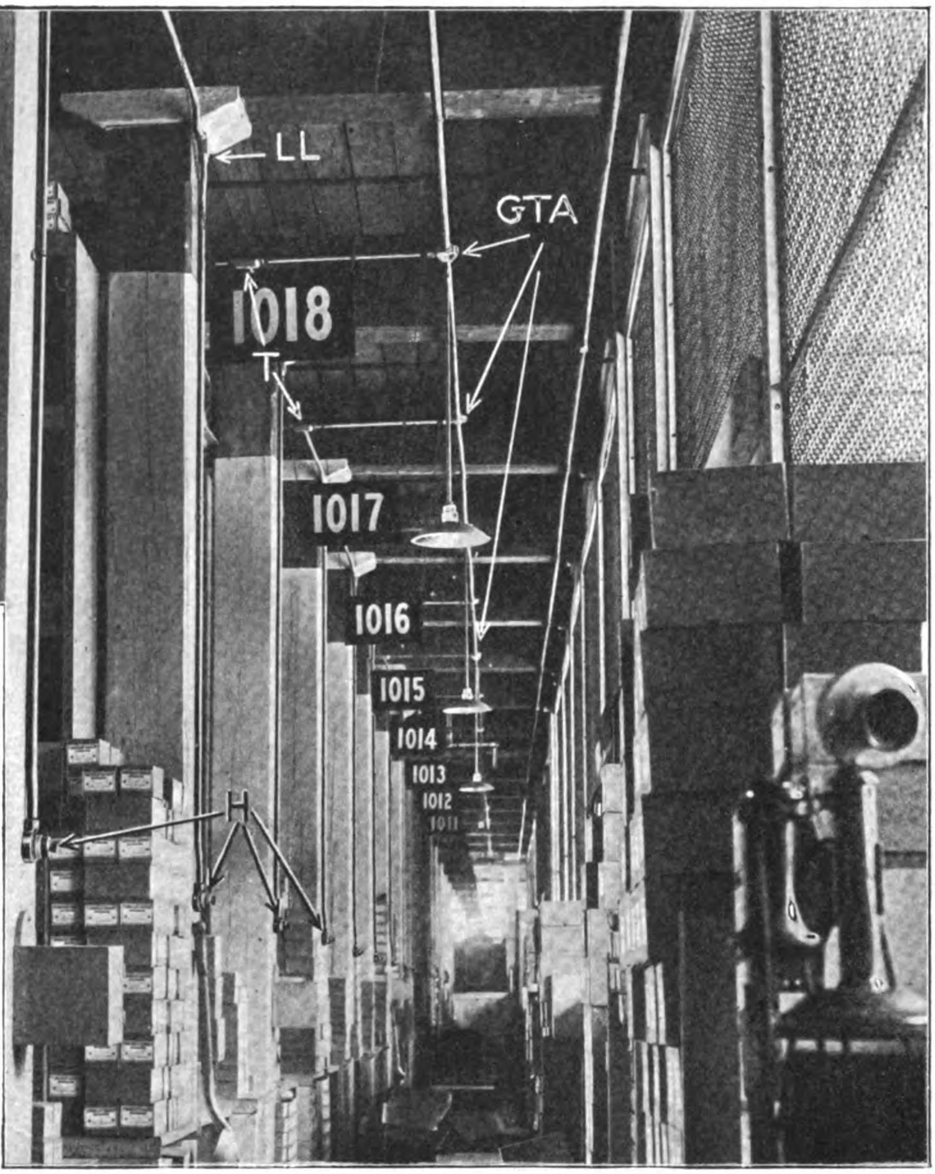
BRACKETS, Telephone.

DE VEAU TELEPHONE MFG. CO., 477 18th st., Brooklyn, "Victor."
HOLTZER-CABOT ELEC. CO., Boston, Mass., "Equipoise," "Ad-a-Link."
MANHATTAN ELECTRICAL SUPPLY CO., 17 Park pl., New York, N. Y., "Mesco."
STANLEY & PATTERSON, 23 Murray st., New York, "Imperial."
Alliance Specialty Mfg. Co., Lakewood, O.
American Elec. Co., Chicago, "Burns" ("Radio" Telephone Holder).
American Steel Works Co., Boston, Mass., "Peerless Fonarm."
Chicago Writing Machine Co., Galesburg, Ill., "Adjustaphone."
Goodline Mfg. Co., Kent, O.
McLeod-Ward & Co., New York, N. Y., "Ward."
Schofield & Co., New York, N. Y.
Seely Office Appliance Co., New York, N. Y., "Phone-ezc."

A Factory Installation Having Many Advantages

Conduit is Below and Independent of Beams





Type LL Condulet

Type CO Condulet

Type T Condulet

Type GTA Condulet

Type H Condulet

Type GXA Condulet

THIS form of installation gives straight runs of conduit—no breaking around beams or piping—and makes wire pulling easy.

The whole system is held by pipe supports that screw into the top hubs of types GTA and GXA Condulets.

These and all other Condulets are illustrated and listed in Condulet Catalog No. 1000. This 200-page book is yours for the asking.

Crouse-Hinds Company

SYRACUSE, N. Y., U. S. A.

NEW YORK BOSTON CINCINNATI CHICAGO

Skelley Bracket Co., Cleveland, O.
Van Akin, Jr., S. L., Liverpool, N. Y.
Warner Electric Co., Muncie, Ind.
Wilhelm Tel. Mfg. Co., Buffalo.

BRAKES, Automobile Elec.

Hartford Suspension Co., Jersey City.

BRANCH BLOCKS.
See Blocks, Moulding.

BRANCH OFFICES AND AGENCIES.

See Pages 202-203-204

BRANDING IRONS.
See Heating Devices.

BRASS TUBING. See Tubing, Brass.

BRASS AND COPPER.

Sheet—Rod—Tube.
PLUME & ATWOOD MFG. CO., Waterbury, Conn.
WHITE MFG. CO., 111 N. Third st., Brooklyn, N. Y.
Am. Brass Co., Waterbury, Conn.
American Brass & Copper Co., N. Y.
Bridgeport (Conn.) Brass Co.
Detroit Copper & Brass Rolling Mills, Detroit, Mich.
Hendricks Bros., New York, N. Y.
Hussey & Co., C. G., Pittsburgh, Pa.
Manhattan Brass Co., New York.
New Haven Copper Co., Seymour, Ct.
New Jersey Tube Co., Harrison, N. J.
Randolph-Clowes Co., Waterbury, Ct.
Rome (N. Y.) Brass & Copper Co.
Scoville Mfg. Co., Waterbury, Conn.
Taunton-New Bedford Copper Co., Taunton, Mass.
Waterbury (Conn.) Mfg. Co.

BREAK ARMS.
See Pole Line Hardware.

BRIDGE LIGHTS.
See Lights, Bridge.

BRIDLE RINGS.
See Rings and Hooks.

BROILERS. See Cooking Utensils.

BROODERS. See Farm Equipment

BRUSHES, Commutator.

Carbon—Graphite—Copper Graphite—Wire Gauze—Sheet Metal—Brass Gauze.
CALEBAUGH-BLOCK SELF LUBRICATING CARBON CO., 510 Bulletin Bldg., Philadelphia, Pa.
CUTLER-HAMMER MFG. CO., Milwaukee, Wis. (Sheet Metal).
DIXON CRUCIBLE CO., JOSEPH, Jersey City, N. J. (Graphite).
GENERAL ELECTRIC CO., Schenectady, N. Y. ("Metite" Copper Graphite).
GOLDMARK, JAMES, 83 Warren st., New York ("German-American" Wire Gauze).
HART & CO., Fostoria, O., "Langeben."
MORGAN CRUCIBLE CO., 112 Liberty st., New York, "Battersea" ("Morganite" Copper Graphite).
NUNGESSER CARBON & BATTERY CO., Cleveland, O. (Carbon and Copper Graphite).
SPEER CARBON CO., St. Marys, Pa., "Long Life" (Carbon and Copper Graphite).
American Carbon & Battery Co., East St. Louis, Ill. (Carbon and Copper Graphite).
Barkelew El. Mfg. Co., Middletown, O.
Baylis Co., Bloomfield, N. J.
Becker Bros., Chicago, Ill. ("Perfection" Brass Gauze).
Boston Woven Wire Brush Co., Lynn, Mass.
Chapin Co., Charles E., New York (Wire Gauze, Sheet Metal and Copper Graphite).
Chemelectric Co., Chicago, Ill., "Schweitzer."
Corliss Carbon Co., Bradford, Pa.
Crown Woven Wire Brush Co., N. Y.
Eureka Co., North East, Pa. (Sheet Metal).
Graphite Metallizing Corp., Yonkers, N. Y. (Copper Graphite).
Holmes Fibre Graphite Mfg. Co., Philadelphia, Pa.
Jeandron, W. J., New York, N. Y. (Importer "Le Carbenne" Copper Graphite).
Le Valley Vitae Carbon Brush Co., New York.
National Carbon Co., Cleveland, O., ("Columbia," "Laclede," "Partridge," "Grapheld," "Cophite" Carbon and Copper Graphite).
Ohio Elec. Specialty Mfg. Co., Troy, Ohio. ("Perfection" Brass Gauze).
Perfection Supply Co., New York.
Philadelphia Elec. & Mfg. Co., Philadelphia, Pa. (Sheet Metal).
Pittsburgh Carbon Brush Co., Pittsburgh, Pa.
Pure Carbon Co., Wellsville, N. Y., "Tungsten."
Reisinger, Hugo, New York (Importer "Brauskol" & "Hemera" Carbon and Copper Graphite).
Salem Elec. Supply Co., Salem, Mass. (Wire Gauze).
Stackpole Carbon Co., St. Marys, Pa.
Star Dynamo Brush Co., New York (Wire Gauze).
Thompson-Bonney Co., Brooklyn, N. Y. ("Acme" Sheet Metal).
Universal Carbon Co., Dundee, Ill.
U. S. Carbon Co., New York, N. Y.
Van Nest Carbon Brush Co., St. Louis.
Walsh Co., J. F., Pittsfield, Mass. ("K. & W." Sheet Metal).

BRUSHES, Globe.

Bradley & Smith, New York, N. Y.
Hanlon & Goodman Co., New York.
Storey Brush Co., New York, N. Y.

BRUSHES, Pneumatic.

PAASCHE AIR BRUSH CO., 7E S. Clinton st., Chicago, Ill.
PRICE AIR BRUSH CO., 1249 N. New Jersey st., Indianapolis, Ind.
Eclipse Air Brush & Compressor Co., Newark, N. J.
Liquid Carbonic Co., Chicago, Ill., "Wold."

BUFFERS, PORTABLE.
See Tools, Portable Hand.

BURGLAR ALARMS.

See also Springs, also Annunciators.
METROPOLITAN ELEC. PROTECTIVE CO., 130 W. 26th st., New York, N. Y.
Automatic Alarm Lock Co., New York (Dead Locks).
Duplex Elec. Co., New York.
Holmes Elec. Protective Co., N. Y.
Stewart & Co., S. A., Waltham, Mass. (Door Switch).

BURNERS, Gas Lighting.

House Gas Lighters.
MANHATTAN ELEC'L SUPPLY CO., 17 Park pl., New York.
PARKE & CO., JOHN Y., 29 N. 7th st., Philadelphia, Pa., "Jypco."
ROBERTS ELEC. SUPPLY CO., H. C., 905 Arch st., Philadelphia, "Victor."
American Lava Co., Chattanooga, Tenn., "Universal."
Bogart Co., A. L., New York, N. Y. ("Bartholdi" Automatic).
Cleverly Elec'l Wks., Philadelphia.
Samson Elec. Co., Canton, Mass., "Advance," "Boston."

BURNERS, Oil Lamp.

(Adapter to attach electric lamps to kerosene oil reading lamps.)
PLUME & ATWOOD MFG. CO., Waterbury, Conn., "Ideal."

BUS BARS.
See Bars, Commutator.

BUSHINGS, Box & Cabinet.

FEDERAL SIGN SYSTEM (ELEC.), Lake & Desplaines sts., Chicago, Ill.
FULLERTON ELEC. CO., 109 W. 26th st., New York, N. Y., "Jiffy."
MULTI REFILLABLE FUSE CO., 723 Fulton st., Chicago, Ill.
NEW PROCESS SPECIALTY CO., Enterprise Bldg., Milwaukee, Wis., "Universal."
PASS & SEYMOUR, Solvay, N. Y.
STAR METAL BOX CO., 173 Hudson st., New York, N. Y.
Harter Mfg. Co., Chicago, Ill.
Metal Specialties Co., Kansas City, Mo., "McKinley."
Thordarson Elec. Mfg. Co., Chicago.
V. V. Fittings Co., Philadelphia.
Pisch, Jr., Frank, New York, N. Y.

BUSHINGS, FIBRE.—See Fibre.

BUSHINGS, CONDUIT.
See Fittings, Conduit.

BUSHINGS, LAVA—See Lava.

BUSHINGS, PAPER.
See Sleeves, Paper.

BUSHINGS, PORCELAIN.
See Porcelain.

BUSHINGS, SOCKET.
See Moulded Insulation.

BUSHINGS, STRAIN RELIEF.
See Grips, Strain Relief.

BUSHINGS, Trolley Wheel.

LOVELL & CO., F. H., Arlington, N. J., "Durax."
Graphite Lubricating Co., Bound Brook, N. J.
Hodkins Co., J. F., Gardner, Me.
Ives Co., H. B., New Haven, Conn., "New Haven."

BUTTONS, PUSH.
See Push Buttons.

BUZZERS.—See Bells, Electric.

CABINET STERILIZERS.
See Sterilizers, Instrument.

CABINETS, Bath Light.

BIRTMAN ELECTRIC CO., Chicago, Ill.
Burdick Cabinet Co., Milton, Wis.
Federal-Huber Co., Chicago, Ill.
Kny-Scheerer Co., New York, N. Y.
Metropolitan Engineering Co., New York (Collapsible Bath).
Robinson Electric Mfg. Co., Toledo, O.
Sanitarium Equipment Co., Battle Creek, Mich.

CABINETS, IRON.—See Cabinets, Sheet Steel; also Boxes, Cast Iron.

CABINETS, Sheet Steel

Without Fittings (Empty).
ADAM ELECTRIC CO., FRANK, St. Louis, Mo.
BISSELL CO., F., Toledo, O. ("Security" Cbainets).
BRADY ELECTRIC MFG. CO., New Britain, Conn.
COLUMBIA METAL BOX CO., 226 E. 144th st., New York, N. Y.
CONNECTICUT ELECTRIC MFG. CO., Connecticut and Florence aves., Bridgeport, Conn.
CROUSE-HINDS CO., Syracuse, N. Y.
CUTHBERT ELEC'L MFG. CO., 723 Fulton st., Chicago, Ill.
CUTTER CO., GEORGE, 411 Notre Dame st., South Bend, Ind., "Universal" ("A-W" Switch Box).
DETROIT FUSE MFG. CO., 1411 Rivard st., Detroit, Mich.
ELECTRICAL MFG. CO., 2163 E. 2nd st., Cleveland, O.
FEDERAL SIGN SYSTEM (Electric), Lake & Desplaines sts., Chicago, Ill.
GENERAL ELEC. CO., Schenectady, N. Y.
METROPOLITAN ELEC. MFG. CO., 14th st. and East ave., Long Island City, N. Y.
NATIONAL METAL MOLDING CO., 1107 Fulton Bldg., Pittsburgh, Pa.
PAISTE CO., H. T. (Hart & Hegeman Mfg. Co., Hartford, Conn., Exclusive Selling Agents).
STAR METAL BOX CO., 173 Hudson st., New York, N. Y.
THOMAS & BETTS CO., 103 Hudson st., New York, N. Y.
TANNER & CO., WM. F., Baltimore, Md.
TRUMBULL ELECTRIC MFG. CO., Plainville, Conn.
TRUMBULL-VANDERPOEL ELEC. MFG. CO., Bantam, Conn.
WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa.
A. G. Elec. & Mfg. Co., Seattle.
Allsteelequip Co., Aurora, Ill.
Almstead Mfg. Co., Rochester, N. Y.
Batavia (N. Y.) Switchboard Co.
Baltimore (Md.) Metal Box Co.
Berry-Glosser Co., Marion, O.
Bonnell Co., W. A., New York.
Burns, James F., Philadelphia, Pa., "Readytouse."
Cleveland (O.) Switchboard Co.
Commercial Switchboard Mfg. Co., Denver, Colo.
Consl. Elec. Mfg. Co., Philadelphia.
Dill Mfg. Co., Cleveland, O.
Edmands, Walter S., Boston, Mass.
Electric Apparatus Co., Chicago, Ill.
Elec'l Mfg. Co., Denver, "Caine."
Erie (Pa.) Art Metal Co., "Dandee."
Federal Elec. Co., Pittsburgh, Pa.
Flint Elec. & Mfg. Co., Denver, Colo.
Greater N. Y. Metal Box Co., New York, N. Y.
Hamilton (O.) Sheet Metal Co.
Hauer, J. B., Brooklyn, N. Y.
Heineman & Co., Geo., Philadelphia.
Iron Specialty Co., New York, N. Y.
Johns-Manville Co., H. W., New York.
Kalling Co., A. M., Milwaukee, Wis.
Kirtland Electric Const. Co., Albany.
Krantz Mfg. Co., Brooklyn, N. Y.
Large-Dall Mfg. Co., Phila., Pa.
Leonard-Bundy Electric Co., Cleveland.
McDowell Mfg. Co., Pittsburgh, Pa.
Metropolitan Engrg. Co., New York.
Mutual Electric & Machine Co., Wheeling, W. Va.
Nyelec Switchboard Co., New York.
O. K. Metal Box Co., New York.
Portland (Ore.) El. Maintenance Co.
Pringle Elec'l Mfg. Co., Philadelphia.
Rice Co., Geo. H., Brooklyn, N. Y.
Robb & Blackner, Boston, Mass.
Schmidt Electric Co., A. D., Milwaukee.
Service Elec & Mfg. Co., Minneapolis.
Standard Elec. Fittings Co., Stamford, Conn.
Steel Switchboard Co., W. M., Worcester, Mass.
Steingruber, Geo., Hazlehurst, Mass.
Sterling Switchboard Co., Camden, N. J.
Superior El. Mfg. Co., Minneapolis.
Trio Mfg. Co., Rock Island, Ill.
Troy Elec'l Co., Troy, N. Y., "Teco."
Worcester (Mass.) Elec & Mfg. Co.
Wurdack Elec. Mfg. Co., St. Louis.

CABINETS, Wood.

CROUSE-HINDS CO., Syracuse, N. Y.
CUTTER CO., GEO., 411 Notre Dame st., South Bend, Ind.
TRUMBULL ELEC. MFG. CO., Plainville, Conn.
TRUMBULL-VANDERPOEL ELEC. MFG. CO., Bantam, Conn.
Sterling Switchboard Co., Camden, N. J.

CABLE BELL ENDS.
See Fittings, High Tension.

CABLE CLAMPS.
See Clamps, Cable.

CABLE GRIPS.—See Grips, Cable.

CABLE, Ignition.

AMERICAN STEEL & WIRE CO., Chicago, Ill.
GENERAL ELECTRIC CO., Schenectady, N. Y.
LOWELL INSULATED WIRE CO., Lowell, Mass.
MOORE, ALFRED F., 200 N. 3d st., Philadelphia, Pa.
NEW YORK INS. WIRE CO., 114 Liberty st., New York, N. Y.
PACKARD ELECTRIC CO., 520 Dana ave., Warren, O.
SAFETY INSULATED WIRE & CABLE CO., 114 Liberty st., New York, N. Y.
STANDARD UNDERGROUND CABLE CO., Pittsburgh, Pa.
Bishop Gutta Percha Co., New York.
Boston (Mass.) Ins. Wire & Cable Co.
Crescent Ins. Wire & Cable Co., Trenton, N. J.
Goodrich Co., B. F., Akron, O.
Hazard Mfg. Co., Wilkes-Barre, Pa.
Okonite Co., New York.
Roebling's Sons Co., Trenton, N. J.

CABLE RACKS.—See Racks, Cable.

CABLES, ARMORED HOUSE.
See Conduit, Interior.

CALIBRATORS, Meter.

FORT WAYNE ELEC. WKS. OF GENERAL ELECTRIC CO., 1612 Broadway, Fort Wayne, Ind.
ROLLER-SMITH CO., 203 Broadway, New York, N. Y.

CALLS, Carriage.

EDWARDS & CO., New York, N. Y.
Electric Carriage Call & Specialty Co., New York, N. Y.
Woodruff Carriage Call System, N. Y.

CAMBRIC—See Cloth Insulating.

CANDELABRA SOCKETS. — See Sockets and Receptacles, Min.

CANDLES, ELEC.—See Flashlights.

CANDLES, Glass.

Fixture Candelabra.
GLEASON TIEBOUT GLASS CO., 71 West 23d st., New York, N. Y.
Fensterer & Ruhe, New York, N. Y.
Gill & Co., Philadelphia, Pa.
McFaddin & Co., H. G., N. Y. (Imp.).
Phoenix Glass Co., New York.

CANES, ELEC. ILLUMINATED.
See Toys and Novelties.

CANOPIES, FIXTURE.
See Shells, Chandelier.

CANOPIES, Insulated.

(For ordinary Fixture Canopies. See Shells, Chandelier.)
BECHTOLD, EDMUND E., 1928 Wabash ave., Chicago, Ill.

CANOPY INSULATORS.
See Insulators, Canopy.

CANTHOOKS—See Tools, Pole.

CAPS, CONDUIT.
See Fittings, Conduit.

CAPS, HEATING. See Pads.

CAPS AND SHADES.

Color Caps, Shades, Hoods.
BETTS & BETTS CORPORATION, 258 W. 55th st., New York, N. Y. (Full and Half Color Caps).
REYNOLDS ELECTRIC CO., 422 So. Talman ave., Chicago, Ill. ("Reco" hoods).
A. & W. Elec. Sign Co., Cleveland, O. (Color Shades).

CAPSTANS, Cable Pulling.

HUBBARD & CO., Pittsburgh, Pa.
Hallett Iron Works, Harvey, Ill.
Laurent Cherry Pulley Block, Trenton.

CARBONS, Arc Light.

FRORUP & CO., L. E., 232 Greenwich st., New York (Importers "Arco," "Alba," "Siemens").
Hirschberg Co., H. M., New York, N. Y. (Importers "Plania").
Kandem Elec. Co., New York (Imp.).
Kiewert Co., Charles L., New York (Imp. "Siemans T. B.," "Bio").
National Carbon Co., Cleveland, O. "Columbia," "Silvertip."
Reisinger, Hugo, New York (Importer), "Dia," "Electra," "Neuraberg,' '"Excello," "Hemera."

CARBONS, Battery.

Elk Graphite M'l'ng Co., St. Marys, Pa.
National Carbon Co., Cleveland, O.
Stackpole Carbon Co., St. Marys, Pa.

CARRIAGE CALLS.
See Calls, Carriage.

CARRYING HOOKS.
See Tools, Pole Handling.

CARS, Cable or Messenger.

BISSELL CO., F., Toledo, O., "Security."
FAIRMOUNT ELECTRIC & MFG. CO., Philadelphia, Pa., "Aero."

CARS, TOY.—See Toys & Novelties.

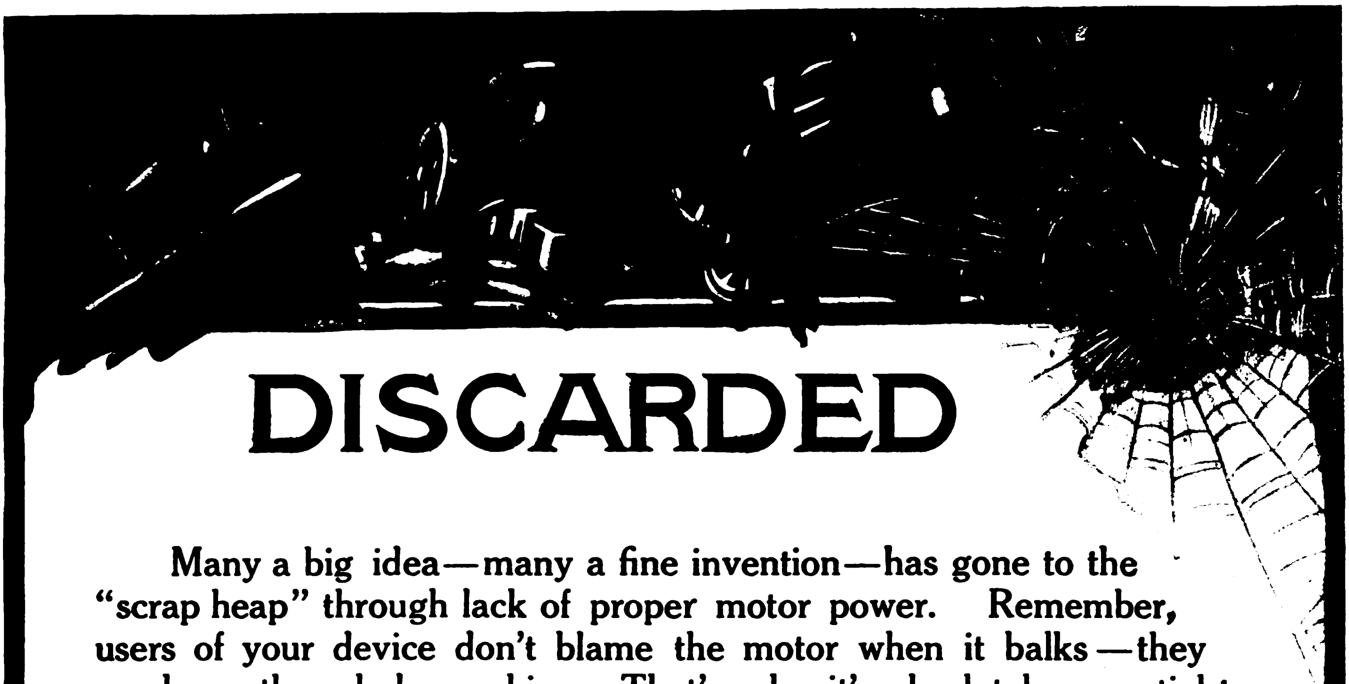
CARTS, Linemen's.

Dicke Tool Co., Downers Grove, Ill.

CASES, BATTERY.
See Holders, Battery

CASES, Flashlight.

DIAMOND STATE FIBRE CO., Bridgeport, Conn.
IMPORT SALES CO., 19 E. 21st st., New York, N. Y. (Imp.).
PEERLESS LIGHT CO., Peerless Bldg., Chicago, Ill.
PROVIDENCE ELECTRIC MFG. CO., Providence, R. I.
ROSEN & CO., A. W., 610 Broadway, New York.
Solar Light Co., New York.
St. Louis (Mo.) Paper Can & Tube Co.



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CASING FIXTURES.
See Tubing, Brass and Copper.

CASTINGS.

Copper, Brass, Bronze, Iron, Steel.

FARIES MFG. CO., 10[illegible]6 E. Grand ave., Decatur, Ill.
LOVELL & CO., F. H., Arlington, N. J. (Brass & Aluminum).
ST. LOUIS MALLEABLE CASTINGS CO., 7777 N. Conduit ave., St. Louis, Mo.
Brylgon Steel Casting Co., New Castle, Del. (for Motors and Generators).
Hess Steel Co., Bridgeton, N. J.
Naugatuck Malleable Iron Wks., Naugatuck, Conn.
Pittsburgh (Pa.) Malleable Iron Co. (Malleable Iron).

CASTINGS.

Moulds for Domes, Shades, Stands.
Empire Pattern Wks., Reading, Pa.

CATCHERS, Trolley Pole.

Catchers, Retrievers.

Ham Sand Box Co., Troy, N. Y., "Trojan."
Lord Mfg. Co., Brooklyn, N. Y., "Earll."
Trolley Supply Co., Canton, Ohio, "Knutson," "American," "Peerless," "Ideal."
Wilson & Co., Brooklyn, N. Y.

CAUTERY RHEOSTATS—See Electro-Therapeutical Apparatus.

CEILING SWITCHES.
See Switches, Pull.

CEILING WAX MELTERS.
See Pots, Melting.

CELLULOID SHADES.
See Shades, Fabric.

CELLAR DRAINERS.
See Drainers, Cellar.

CEMENT, Commutator.

NATIONAL ELEC. CO., 149 W. Austin ave., Chicago, Ill., "Hold-Heet."
WESTINGHOUSE ELEC. & MFG. CO., East Pittsburgh, Pa.
Early, Edward E., Canton, O.
Schifton, Alfred, New York, N. Y., "Mastic 66. S."

CEMENT POLES.
See Poles, Concrete.

CHAFING DISHES. See Cooking.

CHAIN ADJUSTERS.
See Attachments, Socket.

CHAIN, Arc Lamp.

American Chain Co., Bridgeport, Conn., "Oneida."

CHAIN, Fixture

CRYPTOFIL CHAIN CO., 140 Boylston st., Boston, Mass. (Chain with Concealed Wire).
DALLAS & SON, A. C., 225 N. Jefferson st., Chicago, Ill.
PLUME & ATWOOD MFG. CO., Waterbury, Conn., "P. & A."
VIRDEN MFG. CO., 6011 Longfellow ave., Cleveland, O.
WALSH MFG. CO., OWEN, 525 W. 26th st., New York, N. Y.
WHITE MFG. CO., J. H., 111 N. Third st., Brooklyn, N. Y.
Bliss & Co., A. H., Attleboro, Mass.
Hatheway Mfg. Co., Bridgeport, Conn., "Duplex."
McKinnon Chain Co., Buffalo, N. Y.
National Chain Co., New York.
Newhall Chain Forge & Iron Co., New York.
Steele & Johnson Mfg. Co., Waterbury, Conn.
Universal Chain & Metal Stamping Co., New York.
Wakefield Brass Co., F. W., Vermillion, O., "Utility."

CHAIN GLASS. See Crystals.

CHAIN INSULATORS.
See Links, etc.

CHAIN, Power Transmission

Peerless V-Belt Co., Cedar Rapids, Ia.

CHAIN, Pull Socket.

IMPORT SALES CO., 19 E. 21st st., New York, N. Y.
American Ball Chain Wks., New York, "A. B. C."
Arrow Elec. Co., Hartford, Conn.
Bead Chain Mfg. Co., Bridgeport, Ct.
Hatheway Mfg. Co., Bridgeport, Conn., "Duplex."

CHAIR LAMP CLAMP.
See Clamps, Lamp Attaching.

CHAIRS, CABLE.
See Trolleys and Chairs.

CHAIRS, Electric.

Odenwald, John J., Washington, D. C.

CHANDELIERS. See Fixtures.

CHANGERS, LAMP.
See Manipulators, Inc. Lamp.

CHANGERS, Polarity

Current Elec. Co., Chicago, Ill.
Elec. Specialty Mfg. Co., Cedar Rapids, Ia., "Roberts."
Kellogg Switchboard & Supply Co., Chicago, Ill.
Sandwich (Ill.) Elec. Co.
Warner Electric Co., Muncie, Ind.

CHARGING OUTFITS.

Storage Battery.

AMERICAN BATTERY WKS., 1162 Fulton st., Chicago, Ill.
AMERICAN EVER READY WKS. OF NAT'L CARBON CO., Long Island City, N. Y.
CROCKER-WHEELER CO., Ampere, N. J. (Motor Generators).
CUTLER-HAMMER MFG. CO., Milwaukee, Wis.
ECK DYNAMO & MOTOR CO., Bellleville, N. J. (Motor Generator).
ELECTRICAL TESTING CO., 352 Knoxville ave., Peoria, Ill.
GENERAL ELECTRIC CO., Schenectady, N. Y. (Motor Generator).
HOLTZER-CABOT ELECTRIC CO., Brookline, Mass.
KENDRICK & DAVIS, Lebannon, N. H. (Dynamo Charging System).
LINCOLN ELECTRIC CO., 38th st. & Kelley, N. E., Cleveland, O. (Motor Generators).
MOHAWK ELEC. MFG. CO., Newark, N. J.
RELIANCE INSTRUMENT CO., 1135 Van Buren st., Chicago, Ill.
WAGNER ELEC. MFG. CO., St. Louis, Mo.
WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa.
Burke Electric Co., Erie, Pa. (Dynamo Charging System).
Elec. Products Co., Cleveland, O., "Wotton."
Ellington Elec. Co., Quincy, Ill.
Essex Elec. Mfg. Co., Newark, N. J.
Hertner Elec. & Mfg. Co., Cleveland, O.
Hobart Bros. Co., Troy, O.
Ideal Electric Mfg. Co., Mansfield, O. (Dynamo Charging System).
Independent Elec. Machy. Co., Kansas City, Mo.
Marcuson, E., New York ("Witham" for charging Auto Ltg. Batteries).
Marko Storage Battery Co., Brooklyn, N. Y., "Perfection."
National El. Controller Co., Chicago.
Ogden, Clarence E., Cincinnati, O.
Russell Co., E. L., Indianapolis, Ind., "Silent Valve."
St. Louis (Mo.) Elec'l Works.
Tritt Elec. Co., Union City, Ind., "Teco."
Vesta Accumulator Co., Chicago, Ill. (for charging Auto Ltg. Battery).

CHARGING PLUGS AND RECEPTACLES.—See Plugs and Receptacles, Battery charging.

CHARGING RHEOSTATS.
See Rheostats.

CHEMICALS, Battery.

Battery Salts Sal-ammonia.
Bluestone Maganese.

Barrett & Co., M. N., Chicago, Ill. (Sal-ammoniac only).
Black Chemical Co., New York, N. Y., "Electrical" (Sal-ammoniac).
Cooper & Co., Charles, New York.
Eimer & Amend, New York, N. Y.
French Battery & Carbon Co., Madison, Wis. (Importers).
Grasselli Chemical Co., Cleveland, O.
Kalbfleisch Co., F. H., New York.
Klipstein Co., New York, N. Y.
Merck & Co., New York, N. Y.
Picher Lead Co., Chicago, Ill.
Powers-Weightman-Rosengarten Co., Philadelphia, Pa., "Voltak."
Roessler & Hasslacher Chemical Co., New York, "Battery Brand."
Sheles Co., Charles E., New York.
White Dental Mfg. Co., S. S., Phila., Pa., "Parts" Sulpho-Chromic Salt.

CHESTS, Automobile Lamp.

McCANDLESS & CO., H. W., 67 Park pl., New York.
Elux Miniature Lamp Div. Nat'l Lamp Wks. of G. E. Co., New York.

CHIMES, Electric.

BETTS & BETTS CORP., 258 West 58th st., New York N. Y., "Yerkes."
Deagan, J. C., Chicago, Ill.
McClintock-Loomis Co., Minneapolis.

CHOCOLATE WARMERS
See Cooking Utensils.

CHOKE COILS.—See Coils, Choke.

CHOPPERS, Meat.

(Motor Driven.)

Cincinnati Butchers' Supply Co., Cincinnati, O., "Boss."
Cleveland (O.) Elec. & Mach. Mfg. Co.
Coles Mfg. Co., Philadelphia, Pa.
Computing Scale Co., Dayton, O. ("Dayton" Electric Meat Slicer).
Computing Scale & Fixture Co., Cincinnati, O.
Deer Co., Hornell, N. Y., "Royal."
Elec. Cut Coffee Mill Co., Canton, O.
Enterprise Mfg. Co., Philadelphia.
Hobart Elec. Mfg. Co., Troy, O.
Holwick, B. C., Canton, O.
Pan Electric Mfg. Co., St. Louis, Mo.
Smith's Sons Co., John E., Buffalo, N. Y., "Buffalo Silent."
Steiner Mfg. Co., St. Louis, Mo.
Stimpson Scale & Mfg. Co., Northville, Mich., "Peerless."
Universal Store Specialties Co., New Britain, Conn.

CHRISTMAS TREE OUTFITS.
See Decorative Lighting.

CHUCKS, Magnetic.

D. & W. FUSE CO., Providence, R. I.
Diamond Mach. Co., Providence, R. I.
Walker & Co., Worcester, Mass.

CHURNS, ELECTRIC.
See Farm Machinery.

CIRCUIT BREAKERS, Automatic.

CONDIT ELECTRICAL MFG. CO., Boston, Mass.
CUTTER CO., Philadelphia, Pa., "I-T-E," "Dalite," "L-G," "N.X."
GENERAL ELECTRIC CO., Schenectady, N. Y.
ROLLER-SMITH CO., 203 Broadway, New York, N. Y.
WARD LEONARD ELECTRIC CO., Bronxville, N. Y.
WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa.
Automatic Reclosing Circuit Breaker Co., Columbus, O.
Baruch Elec. Controller Co., San Francisco, Cal. (Thermo Relay).
Industrial Controller Co., Milwaukee.

CLAMPS, BEAM.
See Hangers and Clamps.

CLAMPS, Cable Supporting.

L. F. Mfg. Co., 80 Fleet st., Jersey City, N. J.
MATTHEWS & BRO., W. N., 3705 Forest Park blvd., St. Louis, Mo., "Prisections," "Deadendeyes."
Automatic Cable Clamp Co., Donora, Pa.
Diamond Expansion Bolt Co., New York, N. Y., "Long Saut."
Electric Service Supplies Co., Phila.
General Devices & Fittings Co., Chicago, Ill.
Hebendahl Co., J. P., Elizabeth, N. J.

CLAMPS, Ground Connection.

A-A ELEC. MFG. CO., Bridgeport, Conn., "Abbott."
BELDEN MFG. CO., 2303 So. Western ave., Chicago, Ill.
BLACKBURN SPECIALTY CO., 3409 Perkins ave., Cleveland, O.
CONDIT ELEC'L MFG. CO., Boston, Mass., "Shawmut."
FAIRMOUNT ELECTRIC & MFG. CO., Philadelphia, Pa., "Bull Dog," "Vogel," "All-In-One."
FEDERAL SIGN SYSTEM (Electric), Lake & Desplaines sts., Chicago, Ill.
HART MFG. CO., Hartford, Conn., "O. K."
HUBBARD & CO., Pittsburgh, Pa., "Monroe," "Belcher."
PAISTE CO., H. T. (Hart & Hegeman Mfg. Co., Hartford, Conn., Exclusive Selling Agents), "Perma-Effect."
SPRAGUE ELECTRIC WKS. OF GENERAL ELECTRIC CO., 527 W. 34th st., New York, N. Y.
THOMAS & BETTS CO., 103 Hudson st., New York, N. Y.
American Metal Works, Philadelphia.
Bonnell Co., W. A., New York.
Cameron Appliance Co., Everett, Mass., "Boston," "N. Y."
Colgan Co., Wm. H., West Newton, Mass., "Rex."
Diamond Expansion Bolt Co., N. Y.
Electric Service Supplies Co., Philadelphia, Pa., "Keystone."
Forbes, Robert R., Mt. Holly, N. J.
Gillette-Vibber Co., New London, Conn., "Gee Vee."
H. & H. Mfg. Co., Philadelphia, Pa.
Heineman Elec. Co., Philadelphia, Pa., "Advance."
Hickey & Schneider, New York, "Johnson" Temporary Safety Clamp.
Minerallac Electric Co., Chicago, Ill.
National Metal Stamping & Mfg. Co., Newark, N. J.
Novelty Elec. Co., Philadelphia, Pa., "Griptite," "Flexclamp."
Rall, Frederick, New York, "Ideal."
Schutz Mfg. Co., Chicago, "N. C."
Schwartz & Bro., S. Robert, New York, N. Y., "Adjusto."
Stephens Mfg. Co., Philadelphia, Pa.

CLAMPS, Guy Rope & Guy.

AMERICAN STEEL & WIRE CO., Chicago, Ill.
BARNES & KOBERT MFG. CO., Milldale, Conn., "B. & K."
GUND MFG. CO., 320 Jay st., La Crosse, Wis.
HUBBARD & CO., Pittsburgh, Pa.
LANZ & SONS, M., Pittsburgh, Pa.
MATTHEWS & BRO., W. N., 3705 Forest Park blvd., St. Louis, Mo., "Boltless," "2-Bolt."
NATIONAL TEL. SUPPLY CO., Cleveland, O.
ST. LOUIS MALLEABLE CASTING CO., 7777 N. Conduit ave., St. Louis, Mo.
American Hoist & Derrick Co., St. Paul, Minn., "Crosby."
American Iron & Steel Mfg. Co., Lebanon, Pa.
Cook, F. B., Chicago, Ill.
Hallett Iron Works, Harvey, Ill.
Hoopes & Townsend Co., Phila., Pa.
Lamson & Sessions Co., Cleveland, O., "Bull Dog," "Double Grip."
Line Material Co., So. Milwaukee, Wis.
Macomber & Whyte Rope Co., Chicago, Ill.
Michigan Bolt & Nut Works, Detroit.
Mockbee, C. M., Cincinnati, O.
Newhall Chain, Forge & Iron Co. New York, N. Y., "Trident."
Norton, W. T., West Park, O.
Oliver Iron & Steel Co., Pittsburgh.
Specialty Device Co., Cincinnati, O.
Steel Car Forge Co., Pittsburgh, Pa.
Union Elev. & Mach. Co., Chicago.

CLAMPS, Insulator.

Clamps and Supporters.

L. F. MFG. CO., 80 Fleet st., Jersey City, N. J.
STATES CO., Park st. cor. New Park ave., Hartford, Conn., "Kennedy," "Thesco."
STEEL CITY ELECTRIC CO., 1207 Columbus ave., Pittsburgh, Pa., "Universal."
Clark Electric & Mfg. Co., New York.
Coombs & Co., R. D., New York.
Electrical Engineers Equipment Co., Chicago, Ill.
General Devices & Fittings Co., Chicago, Ill.
Hickey & Schneider, New York.

CLAMPS, Lamp Attaching.

Desk—Bed—Mirror—Chair—Sewing Machine Clamps.

PEERLESS LIGHT CO., Peerless Bldg., Chicago, Ill.
PITTSBURGH LAMP BRASS & GLASS CO., Pittsburgh, Pa.
RELIABLE ELECTRIC CO., Chicago, Ill. (Desk Clamp).
WALDMAN, JOHN J., 136 Liberty st., New York, N. Y. ("Jones" Desk and Bed Light).
American Brass & Copper Co., New York, N. Y. (Desk Clamp).
American Elec. Equipment Co., Kansas City, Mo. (Bed Lite).
Franks Mfg. Co., Rock Island, Ill.
Hallbauer-Hardman Mfg. Co., Schenectady, N. Y. ("Liberty" Bed Clamp).
McLeod, Ward & Co., New York, N. Y. (Bed Clamp).
McFaddin & Co., H. G., New York.
Paragon Elec. Co., Chicago, Ill.
Wallace Novelty Co., New York.

CLAMPS, LINEMEN.
See Protectors, Linemen.

CLAMPS, Outlet Tubing.

FEDERAL SIGN SYSTEM (ELEC.), Lake & Desplaines sts., Chicago, Ill.
NEW PROCESS SPECIALTY CO., Enterprise Bldg., Milwaukee, Wis. (Flexible Tubing Clamps).

CLAMPS, Splicing.

Splicing Tools.

Advance Mfg. Co., Pittsburgh, Pa., "Heinze."
Cincinnati (O.) Tool Co., "Hargrave."
Cook, F. B., Chicago, Ill.
Cronk & Carrier Mfg. Co., Elmira.
Dicke Tool Co., Downers Grove, Ill.
Klein & Sons, Mathias, Chicago, Ill.
Smith & Hemenway Co., New York, N. Y., "Red Devil."

CLAMPS, Table.

(Push Button.)

EDWARDS & CO., New York, N. Y.
PARTRICK & WILKINS CO., Philadelphia, Pa.
Samson Elec. Co., Canton, Mass.

CLAMPS, Test

APPLETON ELECTRIC CO., 212 N. Jefferson, Chicago, Ill.
BELDEN MFG. CO., 2308 So. Western ave., Chicago, Ill.
CAMERON APP. CO., Everett, Mass., "Metropolitan."
FAIRMOUNT ELECTRIC & MFG. CO., Philadelphia, Pa., "H. H. W."
HUBBARD & CO., Pittsburgh, Pa., "Peirce."
JORDAN BROS., 74 Beekman st., New York, "Tap-On."
MORSE, FRANK W., Boston, Mass., "Eureka."
RELIABLE ELEC. CO., Chicago, Ill.
STATES CO., Park st., cor. New Park ave., Hartford, Conn.
Anderson Mfg. Co., Albert & J. M., Brookline, Mass., "Alligator-Jaw."
Cook, F. B., Chicago, Ill.
Cutter, Scott G., Oswego, Ill.
Fahnestock Electric Co., B'klyn, N. Y.
Frankel Display Fixture Co., N. Y.
Hallett Iron Works, Harvey, Ill.
Harvard Electric Co., Chicago, Ill.
Mueller & Co., R. S., Cleveland, O. ("Universal," "Big Brute" Insulated).
Schutz Mfg. Co., Chicago, Ill., "N. C."
Smith & Hemenway Co., New York, N. Y., "Red Devil."
Williams Test Clamp Co., Cleveland.

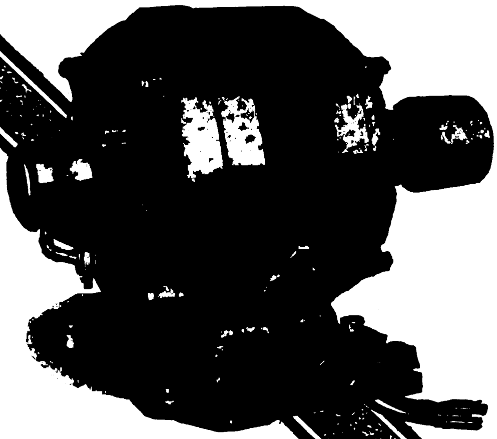
CLEANERS, Globe & Shade.

Myrlite Co., Pownal, Vt.

CLEANERS, Hat.

(Motor Driven.)

FIDELITY ELECTRIC CO., Lancaster, Pa., "Universal."



Two New Robbins & Myers Motors—Direct and Alternating Current

These two new motors represent in every detail the very latest practice in motor design. They are 1915 model in every feature.

Type "K" This type includes a new line of polyphase induction motors, ranging in size from ¼ to 7½ horse-power inclusive. They have squirrel cage type rotors and are suitable for all constant speed services.

The frame is the skeleton type which insures thorough ventilation. The bearings are massive and provided with large oil reservoirs. They are made absolutely dust-proof. The shaft is large and accurately ground to size. In every feature these motors are made as strong and rugged as a motor can be built; and the efficiency and power factor are high.

Robbins & Myers Motors

Type "S" This type includes our new line of steel frame direct current motors, which range in size from ⅛ to 2 horse-power inclusive. These steel frame motors are of very compact construction and are suitable for all services where the space for installing the motor is restricted or light and compact construction is desired for any reason.

The motors can be furnished open, fully enclosed, semi-enclosed or grid enclosed as desired.

Each motor is furnished complete with a sliding base and cast iron pulley. For special services which require such construction, they can also be furnished with idler pulley attachments or with back gears.

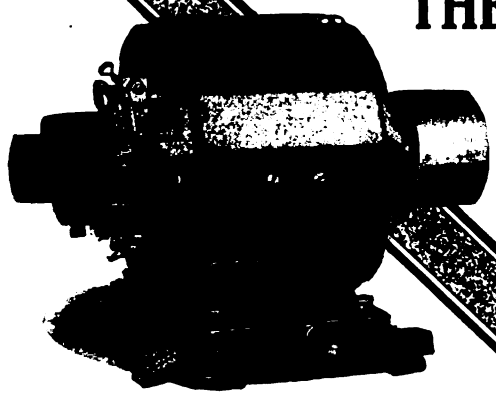
Bulletins Nos. 123 and 121 respectively give complete descriptions of types "K" and "S" motors. Write for copies with prices and discounts

THE ROBBINS & MYERS CO.

SPRINGFIELD, O.

New York Rochester Boston Cleveland Philadelphia Cincinnati Chicago St. Louis

The World's Largest Exclusive Manufacturer of Electric Fans and Small Motors



Basso, Paul, Wilkes-Barre, Pa., "Star."
Saylor Electric & Mfg. Co., Pittsburgh, Pa. (Hat Chuck).
Schnauffer, Wm. A., New York, N. Y.

CLEANERS, INC. LAMP.
See Manipulators, Inc. Lamp.

CLEANERS, Meter.

Davidson Rubber Co., Boston, Mass.

CLEANERS, Switchboard, Pneumatic.

United El. Co., Canton, O., "Tuec."

CLEANERS, Vacuum.

ADVANCE MFG. CO., 2 W. Willard st., Kalamazoo, Mich., "Barnes."
BISSELL CO., F., Toledo, O.
CENTRAL ELEC. CO., Chicago, Ill.
DUNTLEY PRODUCTS SALES CO., 732 Michigan ave., Chicago, Ill.
FEDERAL SIGN SYSTEM (ELEC.), Lake & Desplaines sts., Chicago, Ill.
HURLEY MACHINE CO., 37 So. Clinton st., Chicago, Ill., "Six," "Four."
INNOVATION ELEC. CO., 587 Hudson st., New York, N. Y., "Magic," "Liberty."
MENOMINEE ELEC. MFG. CO., Menominee, Mich.
PITTSBURGH GAGE & SUPPLY CO., Pittsburgh, Pa., "Economy."
VACUUM SUPPLY CO., 300 S. Main st., Ann Arbor, Mich.
WESTERN ELEC. CO., New York, N. Y., "Sturtevant."
WISCONSIN ELEC. CO., 1635 Junction ave., Racine, Wis., "Dumore."
American Radiator Co., Chicago, Ill., "Houston," "Arco Wand" (Stationary).
American Rotary Valve Co., Anderson, Ind. (Plant).
Apex Elec'l Mfg. Co., Cleveland, O.
Astle & Co., H. J., Providence, R. I., "Borland."
Atwood Vacuum Cleaner Co., Rockford, Ill.
Automatic Vacuum Cleaner Co., Bloomington, Ill.
Backus Co., Newark, N. J., "B. A. B."
Bantam Mfg. Co., Cambridge, Mass.
Birtman Elec. Co., Chicago, Ill., "Bee."
Blaisdell Mach'y Co., Bradford, Pa.
Clayton-Marlborough Mfg. Co., Rochester, N. Y., "M. D. S." (Stationary).
Clements Mfg. Co., Chicago, Ill., "Cadillac," "Reliable," "Little Ben," "Big Ben."
Clifton-Pratt Co., Cincinnati, O. (Stationary).
Cyclone Vacuum Cleaner Co., Bradford, Pa., "Champion," "Superb."
Doty Mfg. Co., Dayton, Ohio.
Dunn, E. B., New York (Stationary).
Eclipse Machine Co., Sidney, O.
Eureka Vacuum Cleaner Co., Detroit.
Everson Mfg. Co., Boston, Mass.
Excello Mfg. Co., Chicago, Ill.
Frantz Premier Co., Cleveland, O.
Geier Co., P. A., Cleveland, Ohio, "Royal."
Guelson & Wathe, Mason City, Ia., "Monarch."
Hanlon & Wilson, Wilkinsburg, Pa., "Vak-Klean."
Hoover Suction Sweeper Co., New Berlin, Ohio.
Hugro Mfg. Co., Warsaw, Ind., "Golden Rod," "National."
Milwaukee (Wis.) Vacuum Machy. Co.
Monarch Vacuum Cleaner Co., Bradford, Pa.
Morrow Co., Waukegan, Ill.
National Stamping & Elec. Wks., Chicago, Ill., "Red Ring."
Pacific Suction Cleaner Co., San Francisco, Cal., "Little Giant."
Palm Vacuum Cleaner Co., Detroit.
Peerless Mfg. Co., Cleveland, Ohio.
Perfection Vacuum Cleaner Co., Chicago, Ill.
Pittsburgh (Pa.) Elec. Specialties Co.
Pneuvac Co., Boston, Mass.
Quam Pneumatic Cleaner Co., Milwaukee, Wis.
Racine Electric Co., Racine, Wis.
Ramey Co., Chillicothe, O., "Duplex," "Simplex."
Regina Co., New York, N. Y.
Richmond Radiator Co., New York, "Norfolk."
Robertson Mfg. Co., Cincinnati, O.
Rumsey Engine & Machine Co., C. B., Friendship, N. Y.
Sanitary Vacuum Cleaner Co., Medford, Mass.
Santo Mfg. Co., Philadelphia, Pa.
Semco Vacuum Cleaner Co., Nashville.
Shedd Elec. Co., Roselle, N. J.
Spencer Turbine Cleaner Co., Hartford, Conn.
Standard Mfg. Co., Syracuse, N. Y., "Wands."
Sterling Machine & Stamping Co., Wellington, O., "Diamond," "Brilliant."
Thurman Vacuum Cleaner Co., St. Louis, Mo.
United Electric Co., Canton, Ohio ("Tuec" Stationary).
United States Radiator Co., Detroit.
Utilities Service Co., Cleveland, O., "Apex."
Vacuna Sales Co., New York, "Utility."
Vacuum Supply Co., Ann Arbor, Mich.
Victor Vacuum Cleaner Co., Cleveland, O. (Stationary).
Webb-Baxter Co., Anderson, Ind.
Winans Mach Co., Binghamton, N. Y.
Wise-Harrold Elec. Co., New Philadelphia, O., "Ohio," "Simplicity."

CLEANERS & POLISHERS.

Floor cleaners—Scrubbers—Surfacers—Mops—Polishers, Motor Driven.
SCHLUETER, M. L., 225 W. Illinois st., Chicago, Ill.
Am. Floor Surfacing Mch. Co., Toledo, O.
Elec. Rotary Mach Co., Chicago, Ill.
Finola Mfg. Co., Hannibal, Mo., ("Jewel" Scrubbing Machine).
Floor Sanding & Polishing Machine Co., Philadelphia, Pa.
Intnl. Floor Mach Co., New York.
J. C. M. Mfg. Co., New York, N. Y.
Kelley Elec. Mach Co., Buffalo.
Sanitary Scrubbing Machine Co., New York.
Strickland, E. S., Bound Brook, N. J.
United Mfg. Co., Kansas City, Mo., "Peerless."
Wayvelle, Chappell & Co., Chicago, Ill.

CLEATS, CONDUIT.
See Hangers, Conduit.
CLEATS, FIBRE.—See Fibre.
CLEATS, PORCELAIN.
See Porcelain.
CLEATS, WOOD.
See Mouldings, Wood.

CLIMBERS, Lineman's.

OSHKOSH MFG. CO., Oshkosh, Wis., "Roberts."
Blakeslee Forging Co., Plantsville, Conn., "Donnelly."
Buckingham W. H., Binghamton, N. Y., "Stephens."
Cincinnati (O.) Tool Co., "Hargrave."
Cronk & Carrier Mfg. Co., Elmira, N. Y., "Sure Grip."
Dicke Tool Co., Downers Grove, Ill.
Kilborn & Bishop Co., New Haven.
Klein & Sons, Mathias, Chicago, Ill.
Lowentraut, P., Newark, N. J.
Reidy, John J., New Haven, Conn.
St. Johnsbury Tool Wks., St. Johnsbury, Vt., "Vermont."
Smith & Hemenway Co., New York, N. Y., "Neverturn."

CLIPPERS, Bolt.

PORTER, H. K., 6 Ashland st., Everett, Mass., "Easy," "Allen Randall."

CLIPPERS, Horse.

Motor Driven.
RELIABLE ELECTRIC CO., Chicago, Ill.
American Shearer Mfg. Co., Nashua, N. H., "Priest."
Chicago Flexible Shaft Co., Chicago, Ill., "Steward."
Coates Clipper Mfg. Co., Worcester.
Packer & Sons, La Grange, Ill.

CLIPS, CABLE. See Hangers, Cable.

CLOCKS, Alarm (Electric).

MANHATTAN ELECTRICAL SUPPLY CO., 17 Park pl., New York.
Darche Mfg. Co., Chicago, "Fine Light."
Western Clock Co., La Salle, Ill.

CLOCKS, Elec., Self-Winding.

Parent and Programme.
BETTS & BETTS CORPORATION, 258 W. 55th st., New York, N. Y., "Obermiller," "Elektrik Kloks."
HOWARD CLOCK CO., E., 373A Washington st., Boston, Mass.
Baird Equipment Co., Chicago, Ill.
Electric Time & Mfg. Co., West La Fayette, Ind., "Moore."
Electro Clock Co., Baltimore, Md.
Gillette Elec. Co., Chicago, Ill. (Secondary Clock System.)
Imperial Electric Clock Co., St. Louis.
Landis Engineering & Mfg. Co., Waynesboro, Pa., "Frick."
Magneta Co., New York, N. Y.
Self-Winding Clock Co., Brooklyn.
Standard Electric Time Co., Springfield, Mass.
Stromberg Elec. Co., Chicago, Ill.
Synchronome Co., Brooklyn, N. Y.
Tiffany Elec. Mfg. Co., Buffalo, N. Y.
Walker Bros. & Haviland, Chicago, Ill., "Monarch" Selfwinding.

CLOCKS, Electrically Lighted, Table.

AMERICAN EVER READY WKS. OF NAT'L CARBON CO., Long Island City, N. Y.

CLOCKS, Tower.

BETTS & BETTS CORP., 258 West 55th st., New York, N. Y., "Elektrik Kloks."
HOWARD CLOCK CO., E., 373A Washington st., Boston, Mass.
Standard Elec. Time Co., Springfield, Mass.

CLOCKS, Watchmen's.

EDWARDS & CO., New York, N. Y.
HOLTZER-CABOT ELECTRIC CO., Brookline, Mass.
HOWARD CLOCK CO., E., 373A Washington st., Boston, Mass.
MANHATTAN ELECTRICAL SUPPLY CO., 17 Park pl., New York.
American Watchman's Time Detector Co., New York, N. Y.
Eco Magneto Clock Co., Boston.
International Time Recording Co., Endicott, N. Y., "Dey," "Card," "Bundy."
Simplex Time Recorder Co., Gardner, Mass.

CLOTH CUTTERS. See Cutters.

CLOTH, Insulating.

AMERICAN MICA CO., Newton Lower Falls, Mass., "Puritan."
MICA INSULATOR CO., 68 Church st., New York, N. Y., "Empire," "Kablak."
PACKARD ELECTRIC CO., 520 Dana ave., Warren, O.
Irvington Varnish & Insulator Co., Irvington, N. J.
Pittsburgh Insulating Co., Pittsburgh.
Schenectady (N. Y.) Linonite Co.

CLOTHES DRIERS.
See Driers, Clothes.
CLOTHES WASHERS. See Washers.

CLUSTERS, Fixture, Wireless.

See also Fixtures, Lighting.
BENJAMIN ELECTRIC MFG. CO., 120 So. Sangamon st., Chicago, Ill., "Harter."

CLUTCHES, Magnetic.

Electric Hoists.
CUTLER-HAMMER MFG. CO., Milwaukee, Wis.
Electric Controller & Mfg. Co., Cleveland, Ohio.

COCKS, FIXTURE.
See Fittings, Fixture Brass.
COFFEE MILLS. See Mills, Coffee.
COFFEE PERCOLATORS.
See Cooking Utensils.
COIL PRESSES.
See Machines, Armature.
COIL TESTERS.
See Instruments, Pocket.

COILS (Coil Winders).

Wound to Order.
BELDEN MFG. CO., 2308 So. Western ave., Chicago, Ill.
Marion Elec. Mfg. Co., Jersey City, N. J.

COILS, Armature & Field.

See Pages 200-201
ACME WIRE CO., New Haven, Conn. (Field).
ARROW MFG. CO., Snowflake Bldg., Toledo, O.
BELDEN MFG. CO., 2308 So. Western ave., Chicago, Ill.
CHATTANOOGA ARMATURE WKS., Duncan ave. and Belt Ry., Chattanooga, Tenn.
CLEVELAND ARMATURE WORKS, 49th st. and St. Clair ave., Cleveland, O.
COIL MFG. & REPAIR CO., 1011 Power ave., Cleveland, O.
DOUBLEDAY-HILL ELECTRIC CO., Pittsburgh, Pa.
D. & W. FUSE CO., Providence, R. I.
ELECTRIC OPERATIONS CO., Bush Terminal, Brooklyn, N. Y.
ELLIOTT ELECTRIC CO., 322 Champlain ave., Cleveland, Ohio.
MAJOR ELEC. CO., M. E., 9 Rolland st., Wilkes-Barre, Pa.
NELSON, I. R., Newark, N. J
RIDLON CO., FRANK, 158 Summer, Boston, Mass.
STEWART, S. J. (Electric), 312 Carondelet st., New Orleans, La.
WESTINGHOUSE ELEC. & MFG. CO., East Pittsburgh, Pa.

COILS, Choke.

GENERAL ELECTRIC CO., Schenectady, N. Y.
WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa.
Elec. Service Supplies Co., Phila., Pa
Lord Mfg. Co., Brooklyn, N. Y.
Metropolitan Engrg. Co., New York.

COILS, INDUCTION.
See Ignition Outfits.
Also Electric Therapeutical Apparatus.
Also Instruments, Wireless.
Also Batteries, Medical.
COILS, RESISTANCE. See Units, Rods & Grids.
COLOR CAPS. See Caps and Shades.

COLORING, Inc. Lamp.

FRANCHE & CO. C. E., 440 Orleans st., Chicago, Ill., "Permacolor," "Cefco," "Franco."
McGILL MFG. CO., 39 Oak st., Valparaiso, Ind., "Crescent."
Agens & Co., Newark, N. J., "Faultless."
Barrett & Co., M. L., Chicago, Ill.
Brunner Chemical Works, Cincinnati, Ohio, "Queen."
Celluloid Zapon Co., New York.
Egyptian Lacquer Mfg. Co., N. Y.
Hanson & Van Winkle Co., Newark, N. J.
Lacquer Radiant Co., Philadelphia, Pa., "L. R. C."
Opal Chemical Co., Kenilworth, N. J.
Pacific Electric Co., La Crosse, Wis., "Inline," "Karaline."
Universal Elec. Stage Ltg. Co., New York, "Signaloids."
Webster Chemical Co., St. Paul.

COLUMNS, Illuminated.

Tiffany Studios, New York.

COMBS, ELECTRIC.
See Irons, Curling.
COMBINATION SWITCHES — See Switches, Combination, Cut-Out.

COMEALONGS.

Wire Stretchers.
RITTENHOUSE CO., A. E., Honeoye Falls, N. Y. (Wire Stretcher).
WESTERN ELECTRIC CO., New York, N. Y., "Buffalo Grip."
Burr Mfg. Co., Cleveland, Ohio.
Dicke Tool Co., Downers Grove, Ill.
Eureka Co., North East, Pa., "Parallel," "Westfield."
Klein & Sons, Mathias, Chicago, Ill., "American Grip," "Haven's," "Landee's," "Chicago Grip," "Samson."
Lamson & Sessions Co., Cleveland, Ohio, "Bull Dog."
Laurent Cherry Pulley Block Co., Trenton, N. J.
Sawyer, C. L., Miller's Falls, Mass. (Wire Stretcher), "Hercules."
Smith & Hemenway Co., New York, N. Y., "Red Devil."
Union Elec. Mfg. Co., Pekin, Ill., "Never Slip."

COMMUTATOR MACHINES.
See Machines, Armature.
COMMUTATOR CEMENT.
See Cement Commutator.
COMMUTATOR PARTS.
See Specific Article.
COMMUTATOR TRUING TOOLS.
See Tools, Commutator Truing.

COMMUTATORS.

See Pages 200-201
CAMERON ELECL. MFG. CO., Ansonia, Conn.
CLEVELAND ARMATURE WORKS, 49th st. and St. Clair ave., Cleveland, Ohio.
COIL MFG. & REPAIR CO., 1011 Power ave., Cleveland, O.
DOUBLEDAY-HILL ELECTRIC CO., Pittsburgh, Pa.
ELLIOTT ELEC. CO., 322 Champlain ave., Cleveland, Ohio.
HOMER COMMUTATOR CO., Cleveland, Ohio.
LOVELL & CO., F. H., Arlington, N. J. (Automobile).
NASON ELEC. CO., FRANK, 421 Atlantic ave., Boston, Mass.
NELSON, I. R., Newark, N. J.
RIDLON CO., FRANK, 158 Summer st., Boston, Mass.
STEWART S. J. (Electric), 312 Carondelet st., New Orleans, La.

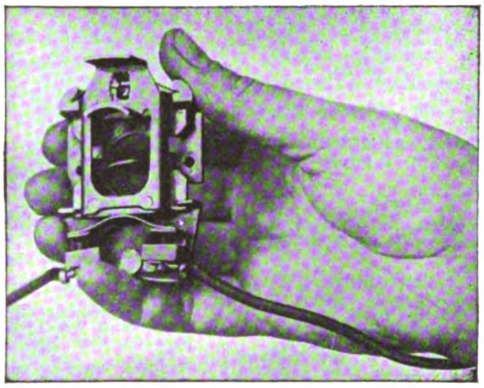
COMPARATORS.
See Instruments, Testing.
COMPENSATORS.
See Moving Picture Apparatus.
COMPOSITION.
See Moulded Insulation.

COMPOUNDS, Commutator; also Pals.

ALLEN CO., L. B., 4550 No. Lincoln st., Chicago, Ill.
CALEBAUGH-BLOCK SELF LUBRICATING CARBON CO., 510 Bulletin Bldg., Philadelphia, Pa., "No Spark."
DIXON CRUCIBLE CO., JOSEPH, Jersey City, N. J.
GOLDMARK, JAMES, 83 Warren st., New York, "Trotter's."
HART & CO., Fostoria, O., "Red Cross."
McGILL MFG. CO., 39 Oak st., Valparaiso, Ind., "Star."
Chicago Solder Co., Chicago, Ill.
Como Electrical Co., Spring Lake, N. J., "Hickley's Hiko."
Crown Woven Wire Brush Co., N. Y.
Du Perow Elec. Co., Washington, D. C., "Deco."
Fowler & Co., G. W., North Tonawanda, N. Y., "Niagara."
Le Valley Vitae Carbon Brush Co., New York, "Gold Medal."
McLennan & Co., K., Chicago, Ill., "Gale's."
Onward Mfg. Co., Menasha, Wis., "O. C. Little's."
Triad Co., Ltd., Belmar, N. J. (Pads).
Walsh Co., J. F., Pittsfield, Mass., "Anti-Spark."
Warren Lubricant Co., Buffalo, N. Y., "Spermo," "Consistency," "Perfection," "Sanderson."

COMPOUNDS, IMPREGNATING.
See Paints and Compounds.
CONCRETE CROSS ARMS.
See Arms, Cross, Concrete.
CONCRETE POLES.
See Poles, Concrete and Cement.
CONDENSERS, ELECTRIC.
See Instruments, Testing.

This is it.



Type CA Motor Starting Switch. This Switch made a million starts.

The Switch That Made a Million Starts

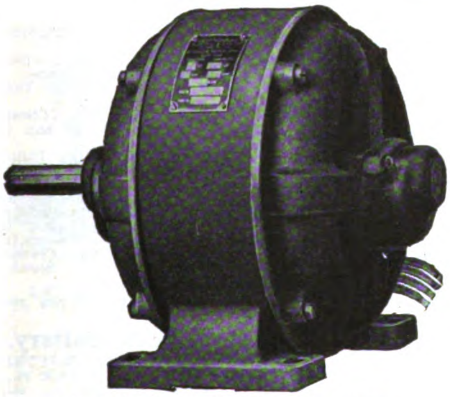
You will find it on Westinghouse single-phase motors of the split-phase type.

Do you realize that this test means a life of 30 years with 100 starts each day.

This is due to:

1. **No current-carrying sliding contacts.**
2. **No friction. No wear.**
3. **Quick make-and-break.**
4. **Heavy contact blocks.**

A centrifugal operating ring on the motor shaft throws the sliding switch in or out. The sliding part is arranged to over-travel so that it is in contact with the operating ring at start and stop only once, instantaneously for each.



Type CA Motor. ½ H.P. Sizes from 1/20 to 1 H.P.

If you have had any experience with single-phase motors you know that the starting switch has been the weakest part.

If you have not had experience let us tell you about it.

You will find it worth your while to send for full information.

Westinghouse Electric & Manufacturing Co.

East Pittsburgh, Pa.

Atlanta, Ga.
Baltimore, Md.
Birmingham, Ala.
Bluefield, W. Va.
Boston, Mass.
Buffalo, N. Y.
Butte, Mont.
Charleston, W. Va.
Charlotte, N. C.
Chicago, Ill.
Cincinnati, Ohio.
Cleveland, Ohio.
Columbus, Ohio.
*Dallas, Texas.
Dayton, Ohio.
Denver, Colo.
Detroit, Mich.
*El Paso, Texas.
*Houston, Texas.
Indianapolis, Ind.
Joplin, Mo.
Kansas City, Mo.
Louisville, Ky.
Los Angeles, Cal.
Memphis, Tenn.
Milwaukee, Wis.
Minneapolis, Minn.
New Orleans, La.
New York, N. Y.
Omaha, Neb.
Philadelphia, Pa.
Pittsburgh, Pa.
Portland, Ore.
Rochester, N. Y.
St. Louis, Mo.
Salt Lake City, Utah.
San Francisco, Cal.
Seattle, Wash.
Syracuse, N. Y.
Toledo, Ohio.
Washington, D. C.
*W. E. & M. Co., Texas

CONDENSERS, Telephone.

CONN. TELEPHONE & ELECTRIC CO., Meriden, Conn.
WESTERN ELECTRIC CO., New York, N. Y.

American Elec. Co., Chicago, Ill.
Automatic Electric Co., Chicago, Ill.
Electric Specialty Co., Cresco, Ia. "Cresco" (Mansbridge Patents).
Garford Mfg. Co., Elyria, O.
Kellogg Switchboard & Supply Co., Chicago, Ill.
Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y.

CONDUCTORS, ARMORED.
See Conduit, Interior.

CONDUIT, Aerial.

Aerial Conduit Co., Wabash, Ind. (Cable Protector for Trees).

CONDUIT, Automobile

Non-Metallic Conduit.
Armored Cable.

GENERAL ELECTRIC CO., Schenectady, N. Y. (Armored Cable).
MOORE, ALFRED F., 200 N. Third st., Philadelphia, Pa. (Armored Cable).
NATIONAL METAL MOLDING CO., 1107 Fulton Bldg., Pittsburgh, Pa. "Auto Flex."
PACKARD ELEC. CO., 520 Dana ave., Warren, Ohio (Armored Cable).

American Metal Hose Co., New York.

CONDUIT FISHING MACHINES.
See Fishing Machines.

CONDUIT, Interior.

Iron—Armored—Flexible Metallic—Flexible Fabric—Armored Cable.

ALPHADUCT CO., 134 Cator ave., Jersey City, N. J.
"Alphaduct" Flexible Non-Metallic.
AMERICAN CIRCULAR LOOM CO., New York, N. Y.
"Electroduct," Enameled Steel.
"Autoduct," Flexible.
"Circular Loom," Flexible.
"Loomflex," Flexible.
"Xduct," Galvanized, Rigid.
AMERICAN CONDUIT MFG. CO., Keystone Bldg., Pittsburgh, Pa., "Galvanite" Rigid, "Wireduct" Flexible Non-Metallic.
CENTRAL TUBE CO., Pittsburgh, Pa., "White," "Superior," "Black," Rigid.
CLIFTON MFG. CO., Jamaica Plain, Boston, Mass. (Rigid).
ENAMELED METALS CO., Pittsburgh, Pa., "Pittsburgh Standard" Rigid.
NATIONAL METAL MOLDING CO., 1107 Fulton Bldg., Pittsburgh, Pa.
"Economy," Rigid.
"Flexduct" and "Flextube" Flexible Non-Metallic.
"Sheraduct" Rigid.
"Flexsteel" Armored Cables.
SAFETY ARMORITE CONDUIT CO., Bailey-Farrell Bldg., Pittsburgh.
"Galvaduct," "Loricated," "Armorduct" Rigid.
"Sterling" Flexible Metallic, Conduit and Armored Cable.
SPRAGUE ELECTRIC WKS. OF GENERAL ELEC. CO., 527 W. 34th st., New York, N. Y.
"Greenfield" Flexible Metallic.
"Greenfieldduct" Rigid.
"B. X." Armored Cables.
STEEL CITY ELECTRIC CO., 1207 Columbus ave., Pittsburgh, Pa.
"Ovalduct" Rigid.
TRUMBULL ELEC. MFG. CO., Plainville, Conn.
Flexible Conduit & Armored Cable.
TUBULAR WOVEN FABRIC CO., Pawtucket, R. I., "Duraduct" Flexible.
WESTERN CONDUIT CO., Youngstown, O.
"Buckeye," Rigid.
"Realflex" Flexible Conduit and Armored Cable.
American Metal Moulding Co., Newark, N. J.
Armored Cable.
Boston (Mass.) Ins. Wire & Cable Co.
Armored Cable.
Columbia Metal Hose Wks., Bayonne, N. J.
Armored Cable.
Eastern Flexible Conduit Co., Brooklyn, N. Y., "Brookduct" Flexible Non-Metallic.
"Brook Steel." Flexible Metallic.
Armored Cable.
Mark Mfg. Co., Chicago, Ill., "Navalite" and "Zinkote" Rigid.
National Enameling & Mfg. Co., Youngstown, O.
"Alumaduct," "Enamelduct," "Armyduct." "Rigid."
Pratt Chuck Co., Frankfort, N. Y.
"Quickstrip" Armored Cable.
Saylor Elec. & Mfg. Co., Pittsburgh.
"Safetube" Flexible.
Smurr & Kamen Co., Chicago, Ill.
Armored Cable.
Trenton Elec. & Conduit Co., Trenton, N. J.
Armored Cable.

CONDUIT THREAD PROTECTORS
See Protectors, Thread.

CONDUIT, Underground

Clay, Wood, Composition, Fibre.

American Clay Products Co., South River, N. J.
American Conduit Co., East Chicago, Ind. (Bitumenized Fibre).
American Cross Arm Co., Chicago, Ill. (Creosoted Wood).
American Sewer Pipe Co., Akron, O.
American Vitrified Conduit Co., N. Y.
Brazil Hollow Brick & Tile Co., Brazil, Ind.
Camp Co., H. B., New York, N. Y., "Camp-Duct."
Chicago Stone Conduit Co., Chicago, Ill., "Stone-Duct."
Clay Products Co., Chicago, Ill.
Clermont Sewer Pipe Co., New York.
Denny Benton Clay & Coal Co., Seattle, Wash.
Dickel Clay Mfg. Co., W. S., Kansas City, Mo.
Fibre Conduit Co., Orangeburg, N. Y.
Grand Lodge Clay Products Co., Grand Lodge, Mich.
Johns-Manville Co., H. W., New York, N. Y. ("J-M" Fibre).
McRoy Clay Works, Chicago, Ill.
Michigan Pipe Co., Bay City, Mich. (Wood).
N. Y. State Sewer Pipe Co., Rochester, N. Y.
Norfolk Creosoting Co., Norfolk, Va. (Creosoted Wood).
Shawmut Clay Mfg. Co., Shawmut, Pa.
Standard Vitrified Conduit Co., N. Y.
Turner, J. W., Des Moines, Ia.
Wyckoff Pipe & Creosoting Co., New York, N. Y. (Creosoted Wood).

CONNECTORS, AUTOMOBILE LAMP.—See Sockets, Ediswan.

CONNECTORS, Battery.

AMERICAN EVER READY WKS. OF NAT'L CARBON CO., Long Island City, N. Y., "Bull Dog."
BLISS-CHESTER CO., 31 Mathewson st., Providence, R. I., "Duplex."
FITZGERALD MFG. CO., Torrington, Conn., "Perfection."
MANHATTAN ELECTRICAL SUPPLY CO., 17 Park pl., New York, N. Y., "Mesco," "Sta-There."
RELIABLE ELECTRIC CO., Chicago, Ill.

Barcy & Nicholson, Detroit, Mich.
Fahnestock Electric Co., B'klyn, N. Y.
Graham Mfg. Co., Providence, R. I., "Goodson."
Hi-Po Waterproof Battery Co., Brooklyn, N. Y.
Knoblock-Heideman Mfg. Co., South Bend, Ind., "Quick Action."
Lemke El. Co., Milwaukee, "L. B."
Lombardi Motor Co., Derby, Conn.
Michigan Motor Specialties Co., Detroit, Mich., "Becco."
Salem Elec'l Supply Co., Salem, Mass.
Shain, Chas. D., Brooklyn, N. Y.
Simplex Auto Specialty Co., Detroit, Mich., "Bolton," "Perfecto."
Stackpole Carbon Co., St. Marys, Pa., "Mills."
Stevens & Co., New York, "Securo."

CONNECTORS, BOX & CABINET.
See Fittings, Conduit.

CONNECTORS, Brass Cylinder.

Cylindrical Tube with Screws.

MANHATTAN ELEC'L SUPPLY CO., 17 Park pl., New York, N. Y.

Harvard Electric Co., Chicago, Ill.

CONNECTORS, Sleeve

BELDEN MFG. CO., 2308 So. Western ave., Chicago, Ill.
BRYANT ELECTRIC CO., Bridgeport, Conn.
FAIRMOUNT ELECTRIC & MFG. CO., Philadelphia, Pa., "H. W. W.," "Alligator."
HOLTZER-CABOT ELECTRIC CO., Brookline, Mass., "H-C" Tubular.
NATIONAL TELEPHONE SUPPLY CO., Cleveland, O.
RELIABLE ELECTRIC CO., Chicago, Ill.

Bryant Zinc Co., Chicago, Ill. ("Premier").
Chicago Die & Mach. Wks., Chicago, Ill. ("Maxtadt").
Cook, F. B., Chicago, Ill.
Clark Electric & Mfg. Co., New York.
Fort Dearborn Mfg. Co., Chicago, Ill., "Zeno."
Harvard El. Co., Chicago, Ill.
McIntire Co., C., Newark, N. J.
Meliorate Mfg. Co., Brooklyn, N. Y.
Metropolitan Engrg. Co., New York.
National El. Specialty Co., Toledo, O. ("Ritetite" Self Soldering).
Smith & Hemenway Co., New York, N. Y. ("Red Devil").

CONNECTORS, Solderless.

Solderless Wire Connectors Light & Power Circuits.

U S E M CO., 221 W. 33rd, New York (N. E. C. Insulating).

Dossert & Co., New York.
Sharfink Elec. Mfg. Corp., New York, "Nosplice."

CONNECTORS, TEST.
See Clamps, Test.

CONNECTORS, Trailer.

To connect Car Ltg. Wires.

Delta-Star Elec. Co., Chicago, Ill. (Automatic Loop Switch).
Electric Service Supplies Co., Philadelphia, Pa. ("Keystone" for Car Lighting).
Loeffelholz & Co., Milwaukee, Wis. "Gibbs."
Novelty Elec. Co., Philadelphia, Pa. (Car Lighting).

CONNECTORS, Trolley Wire

WESTINGHOUSE ELEC. & MFG. CO., East Pittsburgh, Pa.

Drew Elec. & Mfg. Co., Indianapolis, Ind., "Samson" Splicer.
Johns-Manville Co., H. W., New York.
Standard Pulley Co., Cincinnati, O.

CONSULTING ENGINEERS

See Page 198

CONTROLLERS. See Rheostats.

CONTROLLERS, Damper

Electrically Operated.

Elec. Light & Heat Controller Mfg. Co., Johnstown, Pa.

CONTROLLERS, Flat Rate.

Pittsburgh (Pa.) Elec. Specialty Co., "Excess Indicator."

CONVERTERS.
See Motor-Generators.

COOKING UTENSILS, Elec.

AMERICAN ELECTRICAL HEATER CO., Detroit, Mich.
"American Beauty" Toasters—Disc Stoves—Percolators—Chafing Dishes—Samovars—Tea Kettles—Combination Cooking Outfits—Broilers—Ovens—Griddles—Coffee Urns, Also "Triangle" Toaster Stove.
CUTLER-HAMMER MFG. CO., Milwaukee, Wis.
Chocolate Warmers—Disc Stoves—Ovens.
FEDERAL SIGN SYSTEM (ELEC.), Lake & Desplaines sts., Chicago, Ill, Kitchen Cabinet.
GENERAL ELECTRIC CO., Schenectady, N. Y.
Broilers—Chafing Dishes—Cookers—Domestic Ranges—Drying Pans—Kettles—Oven with Broiler—Percolators — Samovars — Toasters — Coffee Pots — Disc Stoves — Hot Plates—"Radiant" Grills.
GLOBE STOVE & RANGE CO., Kokomo, Ind.
Ranges—Percolators—Chafing Dishes—Egg Boilers.
HUGHES ELEC. HTG. CO., 211 W. Schiller st., Chicago, Ill.
Hot Plates—Stoves—Ranges—Toasters.
LINCOLN ELEC. WKS., L. B., 112 W. Adams st., Chicago, Ill.
"Marvel" Toaster.
LINDSTROM-SMITH CO., 1100 S. Wabash ave., Chicago, Ill.
"White Cross" Stove and Toaster.
MANHATTAN ELECTRICAL SUPPLY CO., 17 Park pl., New York.
"Mesco" Toasters.
"Mesco" Disc Stoves.
"Mesco" Chafing Dishes.
"Mesco" Percolators and Stoves.
"Mesco" Sauce Pan Outfit.
"Mesco" Tea Kettle Outfit.
MANTER & CO., E. W., 158 Purchase st., Boston, Mass.
Toasters.
NATIONAL ELEC. CO., 149 W. Austin ave., Chicago, Ill.
"Hold-Heat" Stove and Toaster.
PHELPS MFG. CO., 265 Jefferson ave., Detroit, Mich.
"Cosy" Toasters.
"Detroit" Fireless Cooker.
"Phelps" Disc Stoves and Plates.
P. J. ELEC. HTG. CO., 322 S. La Salle st., Chicago, Ill.
Toasters.
STANDARD ELEC. STOVE CO., Toledo, Ohio.
Fireless Cookers, Grills, Ovens and Stoves.
WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa.
Chafing Dishes—Chocolate Warmers—Disc Stoves—Drying Pans—Frying Pans—Percolators—Samovars—Toaster.
WICKS ELEC. CO., 1384 E. 40th st., N. E., Cleveland, O.
Toasters.

Acme Electric Heater Co., Detroit.
"Autocrat of the Breakfast Table" Toasters.
Bennington (Vt.) Scale Co.
"Nichols" Serving Table.
"Breakfast Stove" Disc Stoves.
Butte Eng'g & El. Co., San Francisco.
Food Carriers.
Buzzini, Walter J., New York.
Ranges — Broilers — Toasters—Plate Warmers.
Cadillac (Mich.) Mfg. Co.
Stove Toaster—Griddles—Ovens.
Caloric Company, Janesville, Wis.
Fireless Cookers.
Copeman Elec. Stove Co., Flint, Mich.
Cook Stoves—Toasters.
Current Elec. Co., Chicago, Ill.
Stoves.
Despatch Mfg. Co., Minneapolis.
Bakery Ovens.
Dur Eco Elec. Co., New York.
Egg Boilers.
Electric Heat Storage Co., New York.
"Therol" Cooker.
Hot Drink Heaters.
Electric Mfg. Co., San Francisco, Cal.
"Emco" Disc Heater.
Empire Transformer Co., Chicago, Ill.
Toasters.
Good Housekeeping Cooker Co., Berkeley, Cal.
"Savr" Cookers.
Hoskins Mfg. Co., Detroit, Mich.
"Toastove" Toasters.
Hot Point Electric Htg. Co., Ontario, Cal.
"El Chafo" Chafing Dish.
"El Stovo" Disc Stove.
"El Glostovo" Stove.
"El Ego" Egg Steamer.
"El Perco" Percolator.
"El Teballo" Tea Ball Pots.
"El Tosto" Toaster.
Hughes & Co., D. C., Chicago, Ill.
Disc Stoves—Percolators—Toasters.
Idaho El. & Mfg. Co., Pocatello, Ida.
Cook Stoves.
Jupiter El. Products Co., Cleveland.
Toasters.
Konsrv Elec. Co., Cleveland, O.
Broilers—Ranges—Fireless Cookers—Ovens—Hot Plates.
"Servu" Fireless Cookers.
Landers, Frary & Clark, New Britain
"Universal," "Thermax" Chafing Dishes — Grills — Percolators — Tea Pots—Coffee Urns—Disc Stoves—Egg Cookers — Grills — Toasters—Samovars.
Manning-Bowman & Co., Meriden, O.
Chafing Dishes—Coffee Percolators—Tea Balls—Tea Urns.
Michigan Stove Co., Detroit, Mich.
"Garland" Range.
Millar Elec. Wks., R. M., Chicago, Ill.
"Utility" Toaster.
Monarch Elec'l Mfg. Co., Willoughby, Ohio—Toaster.
Nat'l Stamping & Elec. Wks., Chicago, Ill.
"Ideal" Stoves.
O. K. Toaster Mfg. Co., Chicago.
Toasters.
Olston Elec. Stove Co., Los Angeles.
Ranges.
Paragon Elec. Co., Chicago, Ill.
"Crown" Toaster.
Pelouze Mfg. Co., Chicago, Ill.
Chafing Dishes, Coffee Urns, Disc Stoves, Percolators.
Stove Toaster and Griddle.
Pittsburgh (Pa.) Elec. Specialty Co.
"Helion" Toaster.
"Helion" Disc Stove.
Presto Elec. Co., San Francisco, Cal.
Pots—Chafing Dish—Egg Boiler—Liquid Urn—Percolators—Stoves—Tea Kettles—Toasters.
Prometheus Electric Co., New York.
Ovens—Chafing Dishes—Percolators—Food and Cup Warmers—Grills—Ranges—Percolators—Tea Pots.
Waffle Irons.
Reliance Elec. Htg. Co., Columbia, Pa., Stoves.
Rochester Stamping Co., Rochester.
Coffee Sets—Tea Sets—Egg Sets—Chafing Dishes — Toasters — Table Grill—Stoves.
Rutenber Elec. Co., Logansport, Ind.
Stoves—Grills—Toasters—Hot Plates—Ovens.
Shaler Co., C. A., Waupun, Wis.
Disc Stoves.
Simplex Electric Heating Co., Cambridgeport, Mass.
Broilers—Cereal Chafing Dishes—Cereal Cookers and Stoves—Frying Pans—Griddles—Hot Closets—Ovens — Percolators — Plate Warmer — Ranges—Sauce Pans and Stoves—Table Range—Tea Kettle—Toasters — Travelers' Stove — Urns — Waffle Irons.
S. P. Stove Co., Wilmette, Ill.
Stoves.
Steward Mfg. Co., Chattanooga, Tenn.
Stoves—Plates—Ovens.
S. W. Elec. Co., New York.
Disc Stoves.
Thermo Mfg. Co., Cleveland, O.
Fireless Cookers and Ovens.
Ranges.
Thermo Stove Co., Plainfield, N. J.
Fireless Cookers and Ovens.
Truitt Elec. Co., Pomonia, Cal.
Toasters—Cookers—Ovens.
Union Electric Products Co., Detroit.
Disc Stoves—Chafing Dishes—Fireless Cookers—Toasters.
Waage Elec. Co., Chicago, Ill.
"Dandy" Toast Stoves.
Disc Stoves.

COPPER.—See Brass and Copper.

COPPERS, Battery.

MANHATTAN ELECTRICAL SUPPLY CO., 17 Park pl., New York.

Beattie Zinc Wks. Co., Reading, Mass.
Bryant Zinc Co., Chicago, Ill.
Edes Mfg. Co., Plymouth, Mass.
Fox & Co., John M., Portland, Me.
Grasselli Chemical Co., Cleveland, O.

CORD ADJUSTERS.
See Adjusters, Cord and Lamp.

CORD, Braided.

(Arc Lamp, Trolley, Bell, Register.)

SAMSON CORDAGE WORKS, Boston, Mass.

Fricke Co., J. E., Philadelphia, Pa. "Jefferson."
International Register Co., Chicago.
Silver Lake Co., Newtonville, Mass.

CORD, FLEXIBLE.
See Wire, Rubber Covered.

CORD HOLDERS.
See Holders, Cord.

CORD TIPS. See Tips, Cord.

660 WATT PUSH BUTTON SOCKETS

WHERE the importance of neatness and serviceability are recognized, C-H Push Sockets have replaced the old style key sockets. Note the sockets on the most popular portables. C-H 660-watt Push Sockets are carried by electrical jobbers and supply dealers.

THE CUTLER-HAMMER MFG. CO.
MILWAUKEE, WISCONSIN

CORES, Resistance Coil.

HARTFORD FAIENCE CO., Hartford, Conn., "Fireite."

CORK BRANDING.
See Heating Devices.

CORN POPPERS.

GENERAL ELECTRIC CO., Schenectady, N. Y.
Boxill & Bruel, Cincinnati, O.
Bullis Auto. Vending Co., Flint, Mich.
Cretors & Co., C., Chicago, Ill.
Elec. Mach. Co., New Albany, Ind.
Holcomb & Hoke Mfg. Co., Indianapolis, Ind.
Turnbull, Werd W., Columbus, O.

COTTERS, Spring.

Hubbard Spring Wks., Pontiac, Mich.

COTTON.—See Yarn and Thread; also Sleeving and Taping.

COUNTERS, Pole.

Benton, James O., New York, N. Y.
Durant Co., W. N:., Milwaukee, Wis.
International Register Co., Chicago.
Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y.
Veeder Mfg. Co., Hartford, Conn.

COUNTERS, Revolution.

BELDEN MFG. CO., 2308 So. Western ave., Chicago, Ill.
BIDDLE, JAMES G., 1211 Arch st., Philadelphia, Pa., "Jagabi" Tachoscope (Imp.).

COUPLINGS, ARC LAMP.
See Hangers, Arc Lamp.

COUPLINGS, CONDUIT.
See Fittings, Conduit.

COUPLINGS, Shaft.

(Insulated.)
Bond Co., Charles, Philadelphia, Pa., "Grundy."

COVERING MACHINES—See Machines, Wire Covering and Stranding.

COVERS, Fan Outlet.

ADAM ELEC. CO., FRANK, St. Louis, Mo.

COVERS & GUARDS.

(Manhole.)
BISSELL CO., F., Toledo, O., "Security."
MORRIS, ELMER P., 136 Liberty st., New York.
Universal Cable Grop Co., Syracuse.

COW MILKERS.
See Farm Equipment.

CROOKS, TUBES. — See Electro Therapeutical Apparatus.

CROSS ARM BRACES AND SUPPORTS.—See Pole Line Hardware.

CROSS ARMS, WOOD.
See Arms, Cross, Wood.

CROWFEET.
See Fittings, Fixture, Iron.

CRYSTALS, Chandelier.

Crystals, Prisms, Beads.
Chandelier, Chains, Fringes.
INTERSTATE ELECTRIC NOVELTY CO., 29 Park pl., New York, N. Y. (Importers).
SCHAFFER CO., MAX, 26 Warren st., New York, N. Y.
SIEGMAN & WEIL, 18 E. 27th st., New York, N. Y.
Canini, I. E., Chicago, Ill.
Euler & Co., Franz, New York, N. Y.
Fensterer & Ruhe, New York, N. Y.
Friedlaender, Oscar O., New York, N. Y., "Cristoleers."
Noe & Sons, Wm. R., New York.

CUPS, Porous.

Marion Pottery Wks., Jersey City.
New England Pottery Co., Boston.
Robinson Clay Product Co., N. Y.

CURLING IRONS.
See Irons, Curling.

CURRENT INDICATORS.
See Instruments, Vehicle & Motor Boat.

CURRENT TAPS. See Taps.

CUSHIONS, Receiver, Tele.

HOLTZER-CABOT ELECTRIC CO., Boston, Mass.
Duvol Rubber Co., Providence, R. I.
Miller Rubber Co., Akron, O.

CUT-OUT HANGERS.
See Hangers, Lamp.

CUT-OUTS.

Enclosed Fuse.
Plug.
Cut-Out Bases.
Fuse Blocks.
ADAM ELEC. CO., FRANK, St. Louis, Mo.
BRYANT ELECTRIC CO., Bridgeport, Conn., "K. W."
CHICAGO FUSE MFG. CO., Chicago, Ill., "Union."
CONDIT ELECTRICAL MFG. CO., Boston, Mass., "Shawmut."
CONNECTICUT ELECTRIC MFG. CO., Connecticut and Florence aves., Bridgeport, Conn.
D. & W. FUSE CO., Providence, R. I.
FREEMAN ELECTRIC CO., E. H., Trenton, N. J.
GENERAL ELECTRIC CO., Schenectady, N. Y.
GRAVES SWITCH BOX CO., 2190 Stearns Road, Cleveland, O. (Open Link).
MANHATTAN ELECTRICAL SUPPLY CO., 17 Park pl., New York, N. Y., "Mesco."
PAISTE CO., H. T. (Hart & Hegeman Mfg. Co., Hartford, Conn.), Exclusive Selling Agents, "Fusette."
TRUMBULL ELECTRIC MFG. CO., Plainville, Conn.
WEBER ELECTRIC CO. (Henry D. Sears, General Sales Agent, 131 State st., Boston, Mass.), Plug Cut-Out Only.
WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa.
Barkelew Elec. Mfg. Co., Middletown, O., "Star."
Chemelectric Co., Chicago, Ill. (Interlinked for Multiphase Motor Protection).
Electric Fuseguard Co., Newark, N. J.
Heinemann Elec. Co., Phila., Pa.
Johns-Manville Co., H. W., New York, N. Y., "Noark."
Metropolitan Engineering Co., New York (Service and Meter Testing).
Mutual Elec. & Mach. Co., Wheeling, W. Va. (Cut Out Bases).
New Haven Elec. Mfg. Co., North Haven, Conn.

CUT-OUTS, Arc Light.

BRADY ELECTRIC MFG. CO., New Britain, Conn.
CUTTER CO., GEORGE, 411 Notre Dame st., South Bend, Ind.
HIGH TENSION ELECTRICAL SPECIALTY CO., Newton, Mass.
GENERAL ELECTRIC CO., Schenectady, N. Y.
MORRIS, ELMER P., 136 Liberty st., New York, N. Y.
G. & W. Elec. Specialty Co., Chicago.
Lundin Elec. & Mach. Co., Boston.
Metropolitan Engrg. Co., New York.
Phila. Elec'l & Mfg. Co., Phila., Pa.
Thompson El. Co., Cleveland, O.

CUT-OUTS, Automatic.

For Series Ltg. Circuits.
Shedd Elec. Co., Roselle Park, N. J.

CUT-OUTS, BATTERY.
See Switches, Battery.

CUT-OUTS, COMBINATION SWITCH.—See Switches, Combination.

CUT-OUTS, Oil Fuse.

High Tension.
D. & W. FUSE CO., Providence, R. I.

CUT OUTS, Service and Meter Test.

DETROIT FUSE & MFG. CO., 1411 Rivard st., Detroit, Mich.
D. & W. FUSE CO., Providence, R. I.
GENERAL ELECTRIC CO., Schenectady, N. Y.
PALMER ELEC. & MFG. CO., Franklin and Congress sts., Boston, Mass.
Johns-Manville Co., H. W., New York.
Metropolitan Engrg. Co., New York.

CUT-OUTS, Transformers.

Primary—Branch Circuit.
BRYANT ELEC. CO., Bridgeport, Ct.
CONDIT ELECTRICAL MFG. CO., Boston, Mass., "Shawmut."
D. & W. FUSE CO., Providence, R. I.
GENERAL ELECTRIC CO., Schenectady, N. Y.
PASS & SEYMOUR, Solvay, N. Y.
WAGNER ELEC. MFG. CO., St. Louis, Mo.
WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa.
Chemelectric Co., Chicago, Ill.
Metropolitan Engrg. Co., New York.

CUTTERS, Carbon & Porcelain.

Hagstrom Bros. Mfg. Co., Linsborg, Kans.
Lundin Elec. & Mach Co., Boston.

CUTTERS, Cloth.

(Motor Driven.)
American Elec. Mach. Co., New York, N. Y. "Waring."
Eastman Mach. Co., Buffalo, N. Y.
Maimin Co., H., New York.
U. S. Cloth Cutting Machine Co., New York.
Universal Cutter Co., St. Louis, Mo.
Wildman Mfg. Co., Norristown, Pa., "Hemafa," "Ballard."
Wolf Elec'l Promoting Co., Cincinnati, O., "Bloch-Wolf," "Star," "Cyclone."
Wright Co., C. E., Kenilworth, N. J.

CUTTERS, Key.

Gussman Key Cutting Mach. Co., N.Y.

CUTTERS, PIPE. — See Stocks, Dies; also Machines, Pipe Cutting.

CUTTERS, SLEET.
See Wheels & Forks, Trolley.

CUTTERS, Storage Battery.

Cutting Lead Plates.
PORTER, H. K., 6 Ashland st., Everett, Mass., "Easy."

CUTTERS, WIRE.
See Pliers, Wire Cutting.

DAIRY APPARATUS.
See Farm Equipment.

DAMPER, CONTROLLERS
See Controllers, Damper.

DASH BOARD LAMPS.
See Lamps, Dash Board.

DEAFNESS, AIDS TO.
See Hearing Devices.

DECORATIVE LIGHTING.

Plants and Flowers.
Christmas Tree Outfits.
Sprays and Leaves.
AMERICAN EVER READY WKS. OF NAT'L CARBON CO., Long Island City, N. Y.
ANGLO-AMERICAN CO., Pittsburgh, Pa. (Tree Outfits).
BEACON MINIATURE ELEC. CO., 118 Duane st., New York (Christmas Tree Ltg. Outfits).
GENERAL ELEC. CO., Schenectady, N. Y. (Christmas Tree Lighting Outfits).
GIBSON ELEC. MFG. CO., 632 Arch st., Philadelphia, Pa. ("Gem" Christmas Tree Outfits).
IMPORT SALES CO., 19 E. 21st st., New York ("Diamond" Christmas Tree Outfit).
INTERSTATE ELECTRIC NOVELTY CO., 29 Park pl., New York, N. Y. ("Franco" Christmas Tree Outfits).
McCANDLES & CO., H. W., 67 Park pl., New York (Christmas Tree Ltg. Outfits).
STANDARD ELEC. NOVELTY CO., 10 N. Desplaines st., Chicago, Ill. (Christmas Tree).
Botanical Decorating Co., Chicago, Ill.
Decorative Plant Co., New York.
Elblight Co. of America, New York.
European Elec'l Floral Decorating Co., New York.
Fensterer & Ruhe, New York, N. Y. (Sprays, Leaves).
Gudeman, E., New York, N. Y.
Gudeman & Co., New York ("Easiest Way" Tree Ltg. Outfits).
Improved Elec. Novelty Wks., Chicago, Ill. (Christmas Tree Outfits).
Ludlow, Miss Frances, New York, N. Y. (Flowers, Trees, Bushes).
Rounds El. Co., Boston (Flowers).
Warren & Co., Walter G., Chicago.

DEFLECTORS, Fan.

GOLDMARK, JAMES, 83 Warren st., New York, N. Y., "Simplex."

DEMAGNETIZERS, Watch.

Boettger & Wittig, Milwaukee, Wis.
Green Elec. Co., W., New York.
Sorsensen P., Brooklyn, N. Y.

DEMAGNETIZING SWITCHES
See Switches, Reversing.

DENTAL APPLIANCES—See Electro-Therapeutical Apparatus.

DEODORIZERS.—See Perfumers.

DESK CLAMPS.—See Clamps, Lamp, Attaching.

DESK LIGHTS. — See Portables; also Clamps, Lamp Attaching.

DETECTORS, GROUND — See Instruments, Testing.

DIES—See Stocks, Dies, Reamers.

DIES & TOOLS.

GRAMMES & SONS, L. F., Allentown, Pa.
Columbus, Die, Tool & Machine Co., Columbus, O.
Harvard Electric Co., Chicago, Ill.

DIMMERS, Headlight.

Automobile.
MORSE, FRANK W., Boston, Mass.
WARD LEONARD ELEC. CO., Bronxville, N. Y., "Nodaz."
Chaney Co., L. F., Springfield, O.
H-P-B Elec. Co., New York.
Servus Equipment Co., Newark, N. J.

DIMMING RHEOSTATS.
See Rheostats.

DISC FANS.—See Fans, Disc.

DISC STOVES.—See Cooking.

DISCS, Armature.

Iron Discs and Segments for Armatures and Transformers.
CLEVELAND ARMATURE WKS., 49 & St. Clair ave., Cleveland, O.
Cary Co., Edward E., New York, N. Y., "Lohys."
Columbus, Die, Tool & Machine Co., Columbus, O. (Die Works).
Smith & Co., Thos., Worcester, Mass.
W. & S. Mfg. Co., Worcester, Mass.

DISINFECTORS.
See Perfumers and Disinfectors.

DISPLAY BOARDS.
See Advertising Devices.

DISTRICT CALL BOXES.
See Fire Alarms.

DOMES—See Shades, Glass.

DOOR SPRINGS.
See Springs, Burglar Alarm.

DOOR SWITCHES.
See Switches, Door.

DRAG IRONS—See Irons, Sad.

DRAINERS, Cellar.

(Motor Driven.)
Chicago Pump Co., Chicago.
Valle-Kimes Co., Dayton, O.

DRESSING COMMUTATOR.
See Compounds, Commutator.

DRIERS, Clothes.

Chicago Dryer Co., Chicago, Ill.
Konsrv Elec. Co., Cleveland, O.

DRIERS, Glove.

McBride Mfg. Co., C. L., Toledo, O.

DRIERS, Hair & Shoe.

CENTRAL TELE. & ELEC. CO., 310 No. 11th st., St. Louis, Mo., "Ajax."
FIDELITY ELEC. CO., Lancaster, Pa., "Universal."
LINDSTROM-SMITH CO., 1100 S. Wabash ave., Chicago, Ill., "White Cross" Hair Drier.
MENOMINEE ELEC. MFG. CO., Menominee, Mich.
SHELTON ELECTRIC CO., New York, N. Y.
Arnold Elec. Co., Racine, Wis.
Barker, James, Philadelphia, Pa., "Mermaid."
Birtman Electric Co., Chicago, Ill., "Bee."
Electric Mfg. Co., San Francisco.
Geier Co., P. A., Cleveland, "Royal."
Halliwell & Co., New York City.
Hamilton-Beach Mfg. Co., Racine, Wis. ("Cyclone" hair and shoe drier).
Kneuth Bros., New York, N. Y.
Thome, Math., Chicago, "Duplex."
Siegfried, Geo., Chicago, Ill.
Sanax Co., New York, "Foen."
Victor Electric Co., Chicago, Ill.

DRIERS & IMPREGNATORS

Armature & Coils.
Buffalo Fdy. & Machine Co., Buffalo.
Devine Co., J. P., Buffalo, N. Y.
Hubbard's Sons, N., Brooklyn, N. Y.
Stokes Mach. Co., F. J., Phila., Pa.

DRILLS, PORTABLE.
See Tools, Portable Hand.

DRILLS & BITS, Electricians'.

HUBBARD & CO., Pittsburgh, Pa. ("Peirce" Hammer Drill for Brick and Stone).
Cincinnati (O.) Tool Co., "Hargrave."
Cleveland Twist Drill Co., Cleveland.
Daugherty-Smith-Phillips Co., Chicago, Ill. ("Phillips" Spring Hammer).
Detroit Twist Drill Co., Detroit.
Diamond Expansion Bolt Co., New York, N. Y., "Rapid Fire."
Dicke Tool Co., Downers Grove, Ill.
Kraeuter & Co., Newark, N. J. (for Brick and Stone).
Mayhew Co., Shelburne Falls, Mass.
National Twist Drill & Bit Co., Detroit.
Osborne, H. G., Brooklyn, N. Y.
Standard Tool Co., Cleveland, O. (for Brick and Stone).
Star Expansion Bolt Co., New York, "Sebco."
Syracuse Twist Drill Co., Syracuse.
Van Expansion Bolt Mfg. Co., Chicago, Ill.

DRINK MIXERS.—See Mixers.

DRIVERS, Staple.

McIntire & Co., Port Chester, N. Y.
Spencer's Sons, I. S., Guilford, Conn.

DROP-OUTS.

Western Engineering Specialties Co., Denver, Colo., "Dostal."

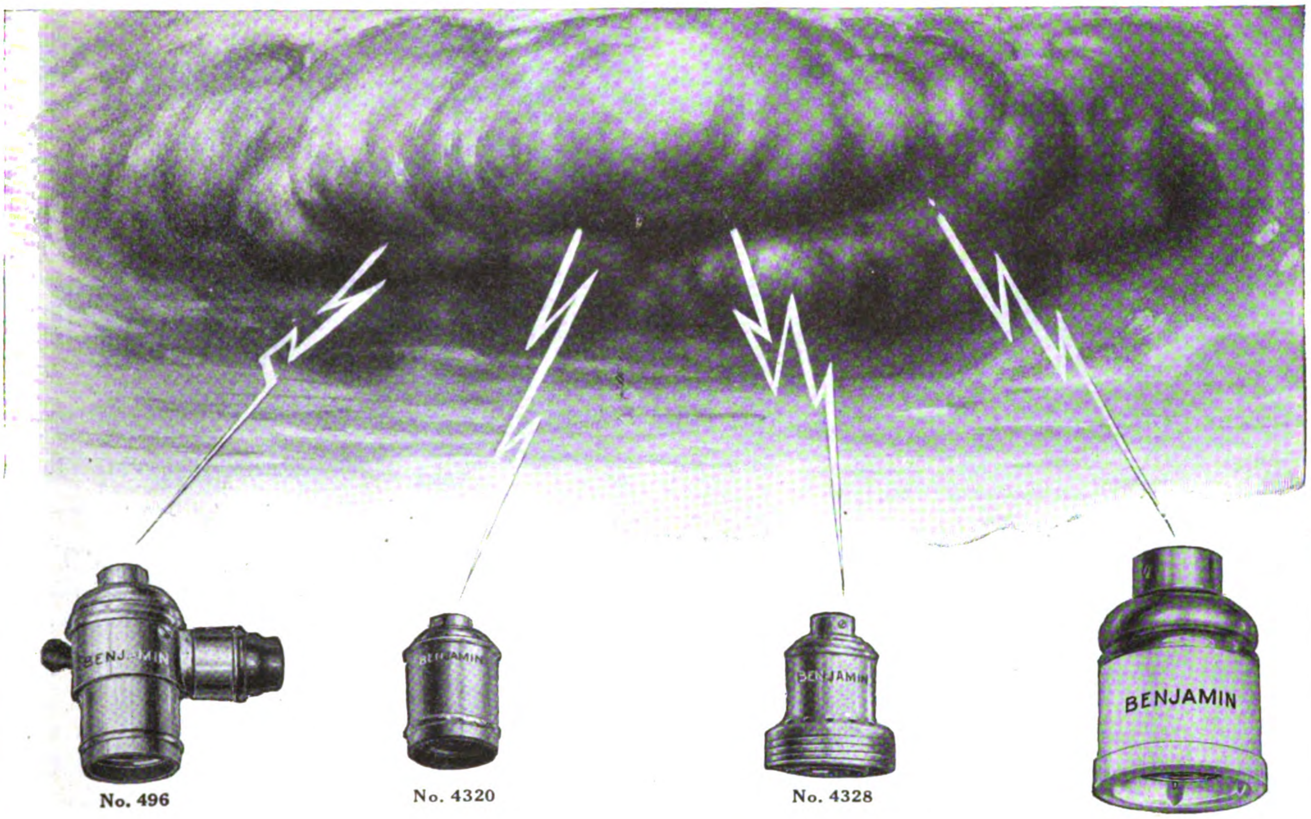
DUMBWAITERS, Electric.

Burdett-Rowntree Mfg. Co., Chicago.
Elec. Dumbwaiter Co., Pittsburgh, Pa.
Otis Elevator Co., New York.
Roberts Elevator Co., J. H., N. Y.
Standard Elec. & Elevator Co., Baltimore, Md., "Seeco-Balto."

DUPODS.—See Fittings, Fix., Iron.

DUSTERS, Pneumatic.

(Armature.)
Chicago (Ill.) Pneumatic Tool Co.
Pfeffer, P., Newark, N. J., "Universal."
Victor Electric Co., Chicago, Ill. (Air Compressor Outfit).



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Under the Most Trying Conditions

Benjamin Sockets

show ability to stand the strain of maximum duty

The Four Benjamin Sockets

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CURRENT TAP SOCKET: Here two devices, current tap and socket, have lent themselves to a combination of convenience permitting the simultaneous use of lamp and any portable electric household appliance.

UNIT-SHELL SOCKETS are shown in two styles—one with regular form of bead at the bottom for standard shade holder; the other, expanded in the lower portion into a threaded support for Benjamin threaded type reflector. The "Unit-Shell" with its solid metal from fixture nozzle to lamp, stands for "glassware safety."

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Benjamin Electric Mfg. Co.
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New York San Francisco Toronto London, Eng.

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DIEHL MFG. CO., Elizabeth, N. J.
ECK DYNAMO & MOTOR CO., Belleville, N. J.
ROLLER-SMITH CO., 203 Broadway, New York.
SPRAGUE ELEC. WKS. OF G. E. CO., 527 W. 34th st., New York.
WESTON ELEC'L INSTRUMENT CO., 43 Weston ave., Newark, N. J.
Foote, Pierson & Co., New York.
Leeds & Northrup Co., Philadelphia.

DYNAMOS, ELECTRO-PLATING.
See Generators, Electro-Plating.

DYNAMOS, LIGHTING.
See Generators, Light & Power.

EBONITE.—See Rubber.

ECONOMIZERS, TUNGSTEN LAMP.—See Transformers, L.V.

ECONOMY COILS—See Coils, Choke.

EDISWAN SOCKETS.
See Sockets, Ediswan.

EGG TESTERS.
See Farm Equipment.

ELECTRO MAGNETS.
See Magnets, Electro.

ELECTRO-MECHANICAL GONGS.
See Bells, Electric.

ELECTRO-PLATING OUTFITS.
See Generators, Electro-Plating.

ELECTRO-THERAPEUTICAL APPARATUS.

Surgical and Dental.

CAMPBELL ELECTRIC CO., Lynn, Mass.
ELECTRO IMPORTING CO., 235 Fulton st., New York, N. Y. (Static Machines).
LINDSTROM-SMITH CO., 1100 S. Wabash ave., Chicago, Ill. ("White Cross" Medical Transformer for Incandescent Circuits).
SHELTON ELEC. CO., New York (Centrifuge).
STERLING CORP., 1275 W. Third st., Cleveland, O. Violet Ray Generators.
Aladdin Company, New York.
Allison Co., W. D., Indianapolis (Physicians' and Surgeons').
Am. X-Ray Equipment Co., New York.
Bachelet Medical Apparatus Co., Brooklyn, N. Y. (Wave Generators).
Baker Electric Co., Hartford, Conn. (Static Machines).
Bell Mfg. Co., Los Angeles, Cal.
Bleadon-Dunn Co., Chicago, Ill. (High Frequency Apparatus).
Butler-Edwards Elec. Co., Easton, Pa. (Dental Appliances).
Commonwealth Elec. & Mfg. Co., St. Louis, Mo. (Electric Pulser).
Cooper Hewitt Elec. Co., Hoboken, N. J.
Eastern Elec. Co., Cleveland, O. (High Frequency Apparatus).
Edwards Inst. Co., Indianapolis ("Junior" High Frequency).
Electro-Dental Mfg. Co., Philadelphia, Pa. (Dental Appliances).
Electric Respirone Co., Cleveland, O.
Electro Surgical Instrument Co., Rochester, N. Y.
Empire Elec. Co., Los Angeles, Cal. ("Rose" X-Ray).
Engeln Electric Co., Cleveland, O.
Foote, Pierson & Co., New York (X-Ray).
Hanovia Chemical & Mfg. Co., Newark, N. J.
Harvard Co., Canton, O. ("Gerhard" Dental Appliances).
International Instrument Co., Cambridge, Mass. (Centrifuge).
Kelley-Koett Mfg. Co., Covington, Ky. (X-Ray).
Kny-Scheerer Co., New York, N. Y. ("Trynauer's" Hot Air Apparatus for Rheumatism).
Lamont, G. E., San Francisco, Cal. (X-Ray).
McElliott, D. P., Chicago, Ill. (Static Machines).
McIntosh Battery & Optical Co., Chicago (Physicians' and Surgeons').
Macalster-Wiggin Co., Boston, Mass. (Switch for Automatically Timing Electric Currents).
Machlette & Son, E., New York ("Cornell" Tubes).
Mayhew Supply Co., Wellington, Kan. (Mouth and Throat Lamp).
Meyer Co., Wm., Chicago, Ill., "Nelson" Static Machine.
Midgley's Radioescent Lamp Co., Kalamazoo, Mich. ("20th Century" Ultra Violet Ray Lamp).
Neel-Armstrong Co., Akron, O., "Oxyoline."
Pacific Surgical Appliance Co., Seattle, Wash. ("Nylander" Elec. Saline Heater).
Pelton & Crane, Detroit (Sterilizers, Gold Annealers and Dentists' Lamp and Cautery Outfits).
Phillips, Wm. A., St. Louis, Mo.
Pittsburgh Elec. Specialties Co., Pittsburgh, Pa., "Me Dico" lamp.
Remco Co., Cleveland, O. (High Frequency).
Ritter Dental Mfg. Co., Rochester ("Columbia" Dental Appliances).
Rogers Electric Laboratories Co., Cleveland, O. (High Frequency).
Rosenthal Elec. Laboratories, Camden, N. J.
Sanitor Co., Chicago, Ill.
Sanitarium Equipment Co., Battle Creek, Mich., "Solar" Therapeutic Arc Lamp.
Scheidel-Weston X-Ray Coil Co., Chicago, Ill. (Static Machines).
Schoenberg Elec. Co., San Francisco.
Siebert-Welch Co., Massillon, O. (Physicians' Elec. Cabinets).
Snook-Roentgen Mfg. Co., Philadelphia, Pa. (X-Ray).
Thordarson Elec. Mfg. Co., Chicago, Ill (X-Ray).
Todd, Henry B., Meriden, Conn. (Static Machines).
Trenaman Dental Mfg. Co., New York (Dental Appliances).
Varwig Mfg. Co., Cincinnati, O. (Physicians' Air Pump).
Victor Elec. Co., Chicago, Ill.
Vulcan Coil Co., Los Angeles, Cal.
Waite & Bartlett Mfg. Co., New York, N. Y. (Physicians' and Surgeons' Supplies).
Wappler Elec. Mfg. Co., New York.
White Dental Mfg. Co., S. S., Philadelphia, Pa. (Dental Appliances).
William, E. Q., Syracuse (X-Ray).
X-Radio Thermo Lamp Co., New York (Thermo Lamp).

ELECTROSCOPES.

Minerallac Elec. Co., Chicago, Ill.
Queen-Gray Co., Philadelphia, Pa.

ELEVATOR SAFETY DEVICES.

HOLTZER-CABOT ELECTRIC CO., Boston, Mass. (Signals).
Andrus & Loveland Co., Detroit.
Black-Woods Mfg. Co., Peoria, Ill.
Boedtcher, Franz A., New York (Door Switch).
Caille Bros. Co., Detroit, Mich.
Chicago (Ill.) Safety Appliance Co.
Elevator Signal Co., New York.
Elevator Supply & Repair Co., Chicago, Ill. (Signals).
Safety Appliance Co., St. Louis, Mo.
Sentinel Safety Elevator Switch Co., Elizabeth, N. J.

ELEVATORS.

(Electric, Hydraulic, Steam.)

Able Elevator Co., Louisville, Ky.
Adt Co., John B., Baltimore, Md.
Albro-Clem Elevator Co., Phila., Pa.
Altizer Elevator Co., Chicago, Ill.
Am. Elec. Mch. & Elevator Co., St. Louis, Mo.
American Elevator Co., New York.
American Machine Co., Louisville.
American Elevator & Machine Co., Louisville, Ky.
Broedesser Elevator Mfg. Co., Milwaukee, Wis.
Cohoes (N. Y.) Iron Fdy. & Mach. Co.
Eastern Machy. Co., New Haven, Ct.
Edmonds Elevator Co., Cleveland, O.
Faunt LeRoy Elevator Co., Baltimore.
Grote Mfg. Co., Evansville, Ind.
Gurney Elevator Co., Honesdale, Pa.
Haughton Elev. & Mach. Co., Toledo.
Hollister-Whitney Co., Quincy, Ill.
Houser Elevator Co., Syracuse, N. Y.
Howard Iron Wks., Buffalo, N. Y.
Kaestner & Hecht Co., Chicago, Ill.
Leo & Hoff, St. Paul, Minn.
Maintenance Co., New York, N. Y.
Marshall Bros., Pittsburgh, Pa.
Mason Co., V. W., Providence, R. I.
Miller Elevator Mfg. Co., Wm. A., St. Louis, Mo.
Montgomery Elevator Co., Moline, Ill.
Moore & Wyman Elevator & Machine Works, Boston, Mass.
Nock & Garside, Denver, Colo.
Norwood Engng. Co., Florence, Mass.
Ohio Elevator & Machine Co., Columbus, O.
Otis Elevator Co., New York, N. Y.
Parkhurst Mfg. Co., Peru, Ind.
R. I. Elevator & Mach. Co., Providence, R. I.
Reedy Elevator Co., New York, N. Y.
Reedy Co., H. J., Cincinnati, O.
Reedy Elevator Mfg. Co., J. W., Chicago, Ill., "Twentieth Century."
Reedy & Co., D. V., Indianapolis.
Roberts Elevator Co., J. H., New York, N. Y .(Dumb Waiters).
See Elec. Elevator Co., A. B., New York.
Seelar Elevator Wks., Pittsburgh, Pa.
Staley El. Elev. & Mach. Co., N. Y.
Standard Plunger Elevator Co., Worcester, Mass.
Sybilla Elevator Co., F., Chattanooga.
Van Emon Elevator Co., B. C., San Francisco, Cal.
Warner Elev. Mfg. Co., Cincinnati.
Warsaw Elevator Co., Warsaw, N. Y.
Washington Elevator Co., Seattle.
Westbrook Elevator Co., Danville, Ill.
Wheeler-McDowell Elev. Co., N. Y.

ELEVATORS, Portable.

N. Y. Revolving Elevator Co., Jersey City, N. J.

ENAMELED WIRE.
See Wire Magnet.

ENAMELING OVENS.—See Ovens.

ENGINEERS, Consulting.

See page 190.

ENGINES, Gas.

CARLISLE & FINCH CO., 221 E. Clifton ave., Cincinnati, O. (Generating Set).
ROCHESTER MOTORS CO., 686 Lexington ave., Rochester, N. Y.

ENGINES, TOY—See Toys.

ENTRANCE BOXES.—See Cabinets, Sheet Steel; also Boxes.

ENTRANCE SWITCHES.
See Switches, Combination.

EXCESS INDICATORS.
See Controllers, Flat Rate.

EXIT SIGNS—See Signs, Exit.

EXPANSION BOLTS.
See Bolts, Expansion.

EXTENSION BELLS.
See Telephones & Switchboards.

EXTENSION SOCKETS.
See Adapters, Lamp.

EXTINGUISHERS, Fire.

ELECTRIC OPERATIONS CO., Bush Terminal, Brooklyn, N. Y., "Safety First."
Inst. Lighter Co., Columbus, O., "Fire Out."
Johns-Manville Co., H. W., New York.
National Metal Stamping & Mfg. Co., Newark, N. J.

FACTORY FIRE ALARMS.
See Fire Alarms, Factory.

FACTORY HORNS.—See Horns.

FACTORY SIGNALS.
See Signals, Factory.

FAN DEFLECTORS. See Deflectors.

FAN OUTLET COVERS.
See Covers, Fan Outlet.

FANS, Battery.

CARLETON CO., 174 Summer st., Boston, Mass.
KENDRICK & DAVIS CO., Lebanon, N. H.
KNAPP ELEC. & NOVELTY CO., 509 W. 51st st., New York, "Little Hustler," "Kenoe."
LIONEL MFG. CO., 48 East 21st, New York, N. Y., "New Departure."
MENOMINEE ELEC. MFG. CO., Menominee, Mich.

FANS, Disc.

CROCKER-WHEELER CO., Ampere, N. J.
DAYTON FAN & MOTOR CO., Bayonne st., Dayton, O.
DIEHL MFG. CO., Elizabeth, N. J.
ECK DYNAMO & MOTOR CO., Belleville, N. J.
EMERSON ELEC. MFG. CO., 2032 Washington ave., St. Louis.
GENERAL ELECTRIC CO., Schenectady, N. Y.
MECHANICAL APPLIANCE CO., Milwaukee, Wis., "Watson."
PEERLESS ELECTRIC CO., Warren, Ohio.
ROBBINS & MYERS CO., Springfield, O.
ROCHESTER MOTORS CO., 686 Lexington ave., Rochester, N. Y.
SPRAGUE ELECTRIC WKS. OF GENERAL ELEC. CO., 527 W. 34th st., New York, "Lundell."
WESTERN ELEC. CO., New York.
WESTINGHOUSE ELECTRIC MFG. CO., East Pittsburgh, Pa.
American Blower Co., Detroit, Mich.
Barney Ventilating Fan Co., Boston.
Bayley Mfg. Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
De Vilbiss Mfg. Co., Toledo, O., "Autocool."
Exeter Mach. Wks., Exeter, N. H.
Fuller Co., Detroit, Mich.
Garden City Fan Co., Chicago, Ill.
Howard & Morse, New York, N. Y., "Blackman," "National."
Ilg Elec. Ventilating Co., Chicago.
Indiana Fan Co., Indianapolis, Ind.
Kimble Elec. Co., Chicago, Ill.
Massachusetts Fan Co., Watertown, Mass., "Davidson."
Natural Power Co., St. Louis, Mo., "Vogel."
New York Blower Co., Chicago, Ill.
Perkins & Sons, Holyoke, Mass.
Protective Ventilator Co., New York.
Rosewater Elec. Co., Cleveland, O.
Seymour, Jr., J. M., Newark, N. J.
Storm Wave Fan Co., Chicago, Ill.
Sturtevant Co., Hyde Park, Mass.
Wing Mfg. Co., L. J., New York, "Typhoon."

FANS, Motor.

Desk, Ceiling, Column, Oscillating.

CARLETON CO., 174 Summer st., Boston, Mass., "Dervish," "Carlton."
CENTURY ELEC. CO., 19th, Pine & Olive sts., St. Louis, Mo.
CROCKER-WHEELER CO., Ampere, N. J.
DAYTON FAN & MOTOR CO., Bayonne st., Dayton, O.
DIEHL MFG. CO., Elizabeth, N. J., "Universal."
ECK DYNAMO & MOTOR CO., Bellevillle, N. J., "Hurricane."
EMERSON ELEC. MFG. CO., 2032 Washington ave., St. Louis, Mo., "Trojan," "Emerson."
FIDELITY ELEC. CO., Lancaster, Pa., "Eclipse" Socket Fan.
FULLERTON ELECTRIC CO., 109 West 26th st., New York, Sole Selling Agents for Star Fan & Motor Works, Newark, N. J.
GENERAL ELECTRIC CO., Schenectady, N. Y.
HUNTER FAN & MOTOR CO., 114 Liberty st., New York, "H. E." ("Tuerk" Ceiling).
KNAPP ELECTRIC & NOVELTY CO., 509 W. 51st st., New York.
LINDSTROM-SMITH CO., 1100 So. Wabash ave., Chicago, Ill., "White Cross."
MANHATTAN ELEC. SUPPLY CO., 17 Park pl., New York, "Mesco."
MENOMINEE ELEC. MFG. CO., Menominee, Mich.
PEERLESS ELECTRIC CO., Warren, Ohio.
ROBBINS & MYERS CO., Springfield, O., "Standard."
SPRAGUE ELECTRIC WKS. OF GENERAL ELEC. CO., 527 W. 34th st., New York, "Lundell" Direct Current.
WESTERN ELECTRIC CO., New York, "Victor."
WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa.
Adams-Bagnall Elec. Co., Cleveland, O., "Gyrofan," "Jandus."
Am. Arc Lamp Co., Kalamazoo, Mich.
Colonial Fan & Motor Co., Warren, O.
Dilg Mfg. & Trading Co., New York, N. Y., "Acme."
Hamilton-Beach Mfg. Co., Racine, Wis., "Cyclone."
Marelli & Co., Ltd., Ercole, New York, N. Y. (Imp.).
Racine (Wis.) El. Co. (Table Fans).
Storm Wave Fan Co., Chicago, Ill.

FARM EQUIPMENT.

Electrically operated.

Acme Egg Tester Co., Louisville, Ky. (Egg Testers).
Ann Arbor (Mich.) Sales Co. ("Electric Daylight" Egg Testers).
Burrell & Co., D. M., Little Falls, N. Y. ("Simplex" Churns and Butter Makers, Milk Testers, Cow Milkers).
Creamery Package Mfg. Co., Chicago, Ill. (Milk Testers).
Cyphers Incubator Co., Buffalo, N. Y., "Electrohens," "Electrobater."
De Laval Separator Co., New York (Cream Separators).
Dozey Churn & Mfg. Co., St. Louis, Mo. (Churns).
Fever, Harry J., Falls City, Neb. (Egg Testers).
International Instrument Co., Cambridge, Mass. (Dairy Apparatus).
Lo-Glo Elec. Incubator Co., New York.
Minnetonna Co., Owatonna, Minn. (Churns).
Ozark Elec'l Co., Aurora, Mo. (Egg Testers).
Sharpless Separator Co., Westchester, Pa. (Cream Separators).
Taylor Bros. Churn & Mfg. Co., St. Louis, Mo. (Elec. Churns).
United Elec. Sales Co., New Orleans, La., "Reeds" Incubators.

FASTENERS, Conduit, NON-METALLIC.—See Fittings, Conduit.

FAULT FINDERS.
See Instruments, Testing.

FEEDER ARMS.
See Pole Line Hardware.

FELT.

American Felt Co., Boston, Mass.
Bacon Felt Co., Winchester, Mass.
Booth Felt Co., Brooklyn, N. Y.
Federal Felting Co., Westerly, R. I.
Felters Co., New York, N. Y.
Kenworthy Bros. & Co., Boston, Mass.
Standard Felt Co., Chicago, Ill.
Stansfield Felting Co., Oxford, Mass.
Stroock & Co., J., New York, N. Y.
Tingue, Brown & Co., New York.
Western Felt Works, Chicago, Ill.
Wild & Co., Joseph, New York, N. Y.

FIBRE,

Sheet—Rod—Tube—Fish Paper—Horn Fibre—Bushings—Washers—Cleats.

CONTINENTAL FIBRE CO., Newark, Del., "Bakelite," "Dilecto."
DELAWARE HARD FIBRE CO., Wilmington, Del.
DIAMOND STATE FIBRE CO., Bridgeport, Pa., "Disfico."
WILMINGTON FIBRE SPECIALTY CO., Wilmington, Del., "Jupiter."
American Vulcanized Fibre Co., Wilmington, Del.
Concrete Fibre Co., Norristown, Pa.
Eastern Hard Fibre Co., Merrimac, Mass.
Empire Mfg. Co., Wilmington, Del.
Keystone Fibre Co., Yorklyn, Pa.
Leatheroid Mfg. Co., Kennebunk, Me., "Dirigo."
National Fibre & Insulation Co., Yorklyn, Del.
Spaulding & Sons Co., J., Tonawanda, N. Y., "Cocheco."
Standard Fibre Co., Somerville, Mass.

FIELD COIL VARNISH.
See Paints and Compounds.

FIELD COILS. See Coils, Armature.

FILAMENTS, Inc. Lamp.

Fahn & McJunkin, New York, N. Y., "Planchon."
Filament Supply Co., Hoboken, N. J. (Carbon).

FIRE ALARMS, Municipal.

Including Police Signals, Call Boxes.

BUNNELL & CO., J. H., 32 Park pl., New York, N. Y., "Vulcan," "Jupiter," "Falcon," "Jove."
DE VEAU TEL. MFG. CO., 477 18th st., Brooklyn, N. Y.

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HOLTZER-CABOT ELECTRIC CO., Brookline, Mass. (Break Glass).
MANHATTAN ELECTRICAL SUPPLY CO., 17 Park pl., New York.
METROPOLITAN ELEC. PROTECTIVE CO., 130 W. 26th st., New York N. Y., "Air Alarm."
OSTRANDER & CO., W. R., 22 Dey st., New York, N. Y.
STANLEY & PATTERSON, 23 Murray st., New York, N. Y., "Faraday."
WESTERN ELECTRIC CO., New York, N. Y.

Aero Fire Alarm Co., New York.
American Fire Alarm Co., Pittsburgh.
Am. Tel. Fire Alarm Co., Chicago.
Automatic Fire Alarm Co., Bradford, Pa.
Automobile Supply Mfg. Co., Brooklyn, N. Y., "Newtone."
Davis Elec. Co., A. P., Baltimore.
Economy Battery Holder Co., Boston.
Foote, Pierson & Co., New York.
Garford Mfg. Co., Elyria, O.
Garl Electric Co., Akron, O.
McFell Signal Co., Chicago, Ill.
National Police Signal Co., Buffalo.
Pearce Co., Fred'k, New York, N. Y.
Russell Elec. Co., Danbury, Conn. (Horns and Whistles).
Samson Elec. Co., Canton, Mass.
Signalphone Alarm Co., Milwaukee.
Special Fire Alarm Electrical Signal Co., New York, N. Y.
Star Electric Co., Newark, N. J.
Utica (N. Y.) Fire Alarm Teleg. Co.
Western May-Oatway Fire Alarms, Los Angeles, Cal.

FIRE ALARMS, Factory.

CONN. TELE. & ELEC. CO., Meriden, Conn.
EDWARDS & CO., New York.
GAMEWELL FIRE ALARM TELEGRAPH CO., Newton Upper Falls, Mass.
MANHATTAN ELEC'L SUPPLY CO., 17 Park pl., New York, N. Y.
METROPOLITAN ELEC. PROTECTIVE CO., 130 W. 26th st. New York, N. Y. ("Air Alarm" and "Hess" Panel Board).
MOHAWK ELEC. MFG. CO., Newark, N. J.
OSTRANDER & CO., W. R., 22 Dey st., New York, N. Y.
PARTRICK & WILKINS CO., Philadelphia, Pa.
SCHWARZE ELECTRIC CO., Adrian, Mich., "Cyclone" Bell.
STANLEY & PATTERSON, 23 Murray st., New York, N. Y.

Aero Fire Alarm Co., New York.
Autocall Co., Shelby, Ohio.
Electric Fire Alarm Co., Sheboygan, Wis.
Garl Elec. Co., Akron, O.
General Fire Extinguisher Co., Providence, R. I., "GFE" Alarm Bell.
Lovell-McConnell Mfg. Co., Newark, N. J., "Klaxon."
Spies Elec. Wks., Chicago, Ill., "Selco" Alarm Bell.
Star Elec. Co., Newark N. J.

FIRE EXTINGUISHER.
See Extinguishers, Fire.
FIRELESS COOKERS.
See Cooking Utensils.
FISH PAPER.—See Fibre.
FISH WIRE.—See Wire, Fish.

FISHING MACHINES,

Conduit Fishing and Threading.
National Conduit Wiring Machine Co., New York, N. Y.

FITTINGS, Conduit.

Box Connectors.
Bendhicks.
Bushings.
Caps.
Couplings.
Locknuts.
Pipe Ends.
Terminals.
Fasteners.

APPLETON ELECTRIC CO., 212 N. Jefferson st., Chicago, Ill., "Unilets," "No Threads."
CHICAGO FUSE MFG. CO., Chicago, Ill. (Fasteners, Bushings & Couplings).
CONDIT ELEC. MFG. CO., Boston, Mass., "Shawmut" Bushings and Locknuts.
CROUSE-HINDS CO., Syracuse, N.Y., "Condulets."
ELECTRICAL SPECIALTY MFG. CO., Providence, R. I. ("Boss" Entrance Bushing).
FAIRMOUNT ELECTRIC & MFG. CO., Philadelphia, Pa. ("Bendhick" Couplings).
FRALICK & CO., S. R., 15 S. Clinton, Chicago, Ill., "Kwikon."
FULLERTON ELEC. CO., 109 W. 20th st., New York, N. Y., "Jiffy" Bushings.
HART & HEGEMAN MFG. CO., Hartford, Conn. (Fasteners).
KILLARK ELEC. MFG. CO., St. Louis, Mo. (W. Douglas Woolley, Gen. Sales Representative, 30 N. Michigan blvd., Chicago, Ill. ("Electrolets" Porcelain Pipe End).
NATIONAL METAL MOLDING CO., 1107 Fulton Bldg., Pittsburgh, Pa. Outlet Bushings & Nut Locks—Box Connectors—Couplings.
NEW PROCESS SPECIALTY CO., Enterprise Bldg., Milwaukee, Wis. ("Universal" Bushings).
PAISTE CO., H. T. (Hart & Hegeman Mfg. Co., Hartford, Conn., Exclusive Selling Agents), "Taplets."
PHELPS, JAMES C., Springfield, Mass., "J. C. P. Caplets" (L. E. Frorup & Co., 232 Greenwich st., New York, Sole Selling Agents).
SPRAGUE ELECTRIC WKS. OF GENERAL ELEC. CO., 527 W. 34th st., New York, N. Y., "Multilets."
STEEL CITY ELECTRIC CO., 1207 Columbus ave., Pittsburgh, Pa. "Fullman," "Star" and "Ovalduct" Bushings.
THOMAS & BETTS CO., 103 Hudson st., New York, N. Y., "T & B," "Erickson" Coupling.

Adapti Mfg. Co., Cleveland, O.
American Bushing Co., Chicago, Ill.
Bonnell Co., W. A., New York (Lock nuts and bushings).
Bossert Co., Utica, N. Y., "Erickson" Bushings.
Christo Mfg. Co., Richmond, Va. "Bull Dog" Loom Clip.
Everhard Mfg. Co., Canton, O., "Diamond E" Service Ell.
Gillette-Vibber Co., New London, Conn. ("G. V." Universal).
Grabler Mfg. Co., Cleveland, O.
Harvard Electric Co., Chicago, Ill.
McCabe Supply Co., Wilkes-Barre, Pa. (Couplings).
Pittsburgh Valves & Fittings Co., Barberton, O.
Pratt Chuck Co., Frankfort, N. Y.
Rattan Mfg. Co., New York, N. Y. Bushings—Locknuts—Box Connectors.
Standard Elec. Fittings Co., Stamford, Conn.
Troy El. Co., Troy, N. Y., "Teco."
V. V. Fittings Co., Philadelphia.

FITTINGS, Fixture, Brass.

Cast Brass Trimmings—Loops—Hooks—Rings—Bowl Holders—Ornaments.
FAIRMOUNT ELECTRIC & MFG. CO., Philadelphia, Pa. ("Emery" Tripods), "Arclets."
FARIES MFG. CO., 1036 E. Grand ave., Decatur, Ill.
MACALLEN CO., Macallen and Foundry sts., Boston, Mass.
PEERLESS LIGHT CO., Peerless Bldg., Chicago, Ill.
PLUME & ATWOOD MFG. CO., Waterbury, Conn.
VIRDEN MFG. CO., 6011 Longfellow ave., Cleveland, O., "V. M. C."
WHITE MFG. CO., J. H., 111 N. Third st., Brooklyn, N. Y.
WILLIAMSON & CO., R., Washington and Jefferson sts., Chicago, Ill.

Am. Brass and Copper Co., New York.
American Pin Co., Waterbury, Conn.
Brandt-Dent Co., Watertown, Wis.
Crescent Brass Mfg. Co., Cleveland.
Crescent Brass Mfg. Co., Reading, Pa.
Hudson Brass Wks., New York, N. Y.
Los Angeles (Cal.) Brass Mfg. Co.
Mayer & Reichert, Brooklyn, N. Y. (Fixture Cocks).
Metal Arts & Crafts Co., Chicago, Ill.
National Metal Spinning & Stamping Co., New York.
Pittsburgh Valve & Fittings Co., Barberton, O.
Shroeder Lamp Wks., Ed., New York.
United Metal Mfg. Co., Norwich, Conn.
Vester & Sons, A., Providence, R. I.

FITTINGS, Fixture (Iron),

Crow Feet Dupods.

CLEVELAND ELEC. FITTINGS CO., 912 Society for Savings Bldg., Cleveland, O. ("Push Up" crow foot).
MACALLEN CO., Macallen & Foundry sts., Boston, Mass.

American Brass & Copper Co., N. Y.
Flagg & Co., Stanley G., Phila., Pa.
Pittsburgh Valve & Fittings Co., Barberton, O.
Rizer Elec. Co., Elgin, Ill.

FITTINGS, High Tension.

Cable End Bells.
Clamp Insulator Supports.
Iron Fittings.
Bushings and Taps.
Buss Supports.
Pot Heads.
Terminal Blocks.
Terminals.

COLONIAL SIGN & INSULATOR CO., Akron, O. (Pot Heads and Terminal Blocks).
FAIRMOUNT ELEC. & MFG. CO., 2203 Pearl st., Philadelphia, Pa.
PHILADELPHIA ELEC. COMPANY SUPPLY DEPARTMENT, 132 S. 11th st., Philadelphia, Pa., "Franklin."
STANDARD UNDERGROUND CABLE CO., Pittsburgh, Pa.

Elec'l Engineers' Equipment Co., Chicago, Ill.
General Devices & Fittings Co., Chicago, Ill.
G. & W. El. Specialty Co., Chicago.
Hickey & Schneider, New York ("Johnson" Transmission Line Clamp).

FITTINGS, MARINE.
See Fixtures, Marine.
FITTINGS, METAL MOULDING.
See Mouldings, Metallic.
FIXTURE BLOCKS.
See Blocks, Wood.
FIXTURE FITTINGS.
See Fittings, Fixture.
FIXTURE HANGERS
See Hangers, Fixture and Box.
FIXTURE JOINTS.
See Joints, Fixture.
FIXTURE STUDS.
See Studs, Fixture.
FIXTURE STAMPINGS OR SPINNINGS.—See Shells.
FIXTURE SWITCHES.
See Switches, Pull.
FIXTURE TRIMMINGS.
See Fittings, Fixture, Brass.
FIXTURE WIRE.
See Wire, Rubber Covered.

FIXTURES, ADJUSTABLE,

Adjustable Wall and Ceiling Ltg. Fixtures.
BRYANT ELEC. CO., Bridgeport, Conn. (Portable Sample Room Ltg. Bracket).
FARIES MFG. CO., 1036 E. Grand ave., Decatur, Ill.
FORG, PETER, Somerville, Mass.

Adjustable Fixture Co., Milwaukee.
Adjustable Light Holder Co., New York.
Empire Specialty Co., Cleveland, Ohio.
Franks Mfg. Co., Rock Island, Ill.
Gall-Webb Mfg. Co., Buffalo, N. Y.
Hardy & Co., F. A., Chicago, Ill.
Hinsdill Elec. Co., Troy, N. Y. (Sewing Mach.).
Van Dorn, E. I., Troy, N. Y. (Sewing Machine).
White Co. O. C., Worcester, Mass.
Zang, J. E., Johnstown, Pa., "Anyangl" Brackets.

FIXTURES, Lighting.

Interior Rigid Fixtures, Permanent.
A-A ELEC. MFG. CO., Bridgeport, Ct.
ADAM ELECTRIC CO., FRANK, St. Louis, Mo., "Reflectolyte."
ALTER LIGHT CO., 826 Loomis st., Chicago, Ill.
BEARDSLEE CHANDELIER MFG. CO., 237 S. Jefferson st., Chicago, Ill., "Foldolite."
BENJAMIN ELEC. MFG. CO., 120 So. Sangamon st., Chicago, Ill. (Unit Drop Light).
BROWE CO., Newark, N. J.
CENTRAL ELEC. CO., Chicago, Ill., "Maxolite" Unit.
COMMERCIAL ELEC. SUPPLY CO., St. Louis, Mo., "New Idea."
CUTTER CO., GEO., 411 Notre Dame st., So. Bend, Ind., "Idealite."
DAISY WOODCRAFT CO., Faribault, Minn. (Wood).
ELECTRIC OPERATIONS CO., Bush Terminal, Brooklyn, N. Y. ("Skeleton" Nitrogen Units).
FARIES MFG. CO., 1036 E. Grand ave., Decatur, Ill., Adjustable Fixtures and "Farieslite" Unit Ltg. Fixtures.
FRIEDLEY-VOSHARDT CO., 733 S. Halstead st. Chicago, Ill.
FORG, PETER, Somerville, Mass. (Adjustable).
FRANKEL LIGHT CO., 5016 Woodland ave., Cleveland, O.
GOSHEN NOVELTY & BRUSH CO., 628 Canal pl., Goshen, Ind.
HERWIG ART SHADE & LAMP CO., 2140 N. Halstead st., Chicago, Ill. (Also Iron).
IDEAL LAMP MFG. CO., Faribault, Minn. (Wood).
ILLUMINATING ENGINEERING CO., 17 Washington blvd., Detroit, Mich.
LUMINOUS UNIT CO., St. Louis, Mo., "Brascolite" Luminous Units.
MACBETH-EVANS GLASS CO., Pittsburgh, Pa., "Alba," "Decora."
McKENNEY & WATERBURY, 181 Franklin st., Boston, Mass.
MORAN & HASTINGS MFG. CO., 16-18 W. Washington st., Chicago.
NATIONAL LTG. FIXTURE MFG. CO., 173 Grand st., New York, N.Y.
NATIONAL X-RAY REFLECTOR CO., 233 W. Jackson blvd., Chicago.
PEERLES LIGHT CO., Peerless Bldg., Chicago, Ill.
PETERS CO., H. J., 320 S. Wabash ave., So. Chicago, Ill.
PETTINGELL-ANDREWS CO., Atlanic ave.-Pearl st.-Purchase st., Boston, Mass.
PITTSBURGH LAMP, BRASS & GLASS CO., Pittsburgh, Pa.
SIEGMAN & WEIL, 18-20 E. 27th st., New York, N. Y. (Crystal Chandeliers).
WALSH MFG. CO., OWEN, 525 W. 26th st., New York, N. Y.
WILLIAMSON & CO., R., Washington and Jefferson sts., Chicago, Ill.
Acme Gas & Elec. Fix. Co., N. Y.
Acme Metal Mfg. Co., Chicago, Ill.
Alexalite Co., New York, N. Y.
American Arc Lamp Co., Kalamazoo, Mich. ("Mazda" Clusters).
American Art Glass Co., New York.
American Dry Ornamental Co., New York, "Metallite."
Andresen Co., Jacob, Minneapolis.
Art Chandelier & Bronze Co., New York, "Novo Bronze," "Madeline."
Art Glass Mfg. Co., New York.
Art Metal Mfg. Co., Cleveland, O. (A-M Nitre Arc Units).
Avondale Chandelier Co., Chicago, Ill.
Bagues, Freres Co., N. Y. (Imp.).
Bailey-Reynolds Gas Fixture Co., Kansas City, Mo.
Baldinger & Kupferman Mfg. Co., Brooklyn, N. Y.
Bauer Gas Fixture Wks., Phila., Pa.
Bayley & Sons, Brooklyn, N. Y.
Bechtle, Otto, Alameda, Cal.
Biddle-Gaumer Co., Philadelphia, Pa.
Black & Boyd Mfg. Co. (L. Plaut & Co.), New York, N. Y.
Bradley & Hubbard Mfg. Co., Meriden, Conn.
Brandt-Dent Co., Watertown, Wis., "Bee-Dee."
Brass Products Co., Southington, Ct.
Bridgeton (N. J.) Chandelier Co.
Brown & Co., W. B., Bluffton, Ind. (Wood).
Burgess Granden Co., Omaha, Neb.
Caldwell & Co., E. F., New York.
Cambridge Brass Co., Boston, Mass.
Camden (N. J.) Gas Fixture Wks.
Cascade Gas & Electric Fixtutre Co., Seattle, Wash.
Cassidy & Son Mfg. Co., New York.
Central Chandelier Co., Chicago, Ill.
Central Chandelier Co., New York.
Central Gas & Elec. Fixture Mfg. Co., Cleveland, O.
Champion Brass Wks., Coldwater, Mich.
Chicago (Ill.) Reed Ware Mfg. Co.
Christensen Bros., Chicago, Ill.
Cincinnati (O.) Artistic Wrought Iron Works.
Collonan Elec'l & Mfg. Co., San Francisco, Cal.
Colonial Chandelier Wks., New York.
Columbia Elec. Co., Seattle, Wash.
Columbia Gas Fixture Co., Brooklyn.
Consolidated Chandelier Co., N. Y.
Crescent Art Metal Co., Bridgeton, N. J.
Crescent Brass Mfg. Co., Cleveland, O., "Show-Pen."
Crown Chandelier Co., New York.
Crown El. Mfg. Co., St. Charles, Ill.
Dale Ltg. Fixture Co., New York.
Day Co., Thos., San Francisco, Cal.
Edwards Ltg. & Fixture Co., Chicago.
Eisenberg & Son, M., New York (also Wrought Iron).
Elec'l Engineering Co., Minneapolis, Minn., "Tru-Lite."
Elgin Brass & El. Mfg. Co., Elgin, Ill.
Elgin Motor Co., Elgin, Ill., "Deflectolier."
Empire Gas Fixture Co., New York.
Englewood Chandelier Co., Chicago.
Equitable Chandelier Co., New York.
Ertel Ltg. Co., Cincinnati, O.
Euclid Ave. Electric Fixture Co., Cleveland.
Everson & Co., C. G., Chicago, Ill.
Excelsior Fixture Co., Cleveland, O.
Falkenbach Mfg. Co., N. Y. (Fibre).
Farber, S. W., Brooklyn, N. Y.
Farley & MacNeill, Boston, Mass.
Featherstone Ltg. Fixture Co., St. Louis, Mo.
Finch Co., J. H., Boston, Mass.
Fischer & Jirouch Co., Cleveland O.
Forve-Pettebone Co., Los Angeles.
Gall-Webb Mfg. Co., Buffalo, N. Y. (Adjustable).
Gaites, Peace & Co., Brooklyn, N. Y.
Garden City Chandelier Co., Chicago.
Gas Fixture & Brass Co., Cleveland.
Geise Mfg. Co., Philadelphia, Pa.
General Ltg. Fixture Co., Cleveland.
General Specialty Co., St. Louis, Mo.
Gibson Gas Fixture Wks., Phila.
Grady Fixture Mfg. Co., M. J., Minneapolis, Minn.
Gray Elec. Co., Springfield, O.
Handel Co., Meriden, Conn.
Harter Mfg. Co., Chicago, Ill., "Shad-o-less," "Nitrolite."
Hartmann-Malcom Co., Chicago, Ill. (Composition).
Heather Co., R. C., New York.
Heywood Bros. & Wakefield Co., Gardner, Mass. (Reed).
Hill & Co., T. D., Philadelphia, Pa. ("Monarch," "Ever-Ready" Adj.).
Horn & Brannen Mfg. Co., Phila.
Hovorka, John D., Chicago, Ill.
Hudson Brass Wks., New York.
Hughes-Nazor Mfg. Co., Mt. Carmel, Ill.
Ideal Gas & Elec. Fixture Co., New York.
Incandescent Supply Co., New York.
Indirect Lt. & Fixture Co., Chicago.
Intnl. Gas Fix. Co., New York.
Jaehnig Gas Fixture Co., Newark.
Jerdee & Hendrikson, Minneapolis.
Johns-Manville Co., H. W., New York, "Frink."
Jones-Bertsch Co., Boston, Mass.
Kempster & Co., Los Angeles, Cal.
Kimberly Co., New York, N. Y.
Klemm & Co., Philadelphia, Pa.
Koscherak Bros., New York (Imp. Staghorns).
Kraushaar Brass Mfg. Co., St. Louis.
Lamb Bros. & Greene, Nappanee, Ind. (Wood).
Landry Fix. & Elec. Co., Cleveland.
Liberty Inc. Light Co., Chicago, Ill.
Libson Co., I., Brooklyn, N. Y.
Lippke, R., Chicago, Ill.
Logue-Stonge Mfg. Co., Phila., Pa.
Loring Co., George, Winthrop, Mass.
McCoy & Son, J. B., New York.
Metal Arts & Crafts Co. Chicago, Ill.
Metallic Mfg. Co., Chicago, Ill.
Meyberg Co., Los Angeles, Cal.
Meyberg Co., Louis J., San Francisco.
Miller & Co., Edw., Meriden, Conn.
Milwaukee (Wis.) Ornamental Carving Co.
Mission Fixture Co., Los Angeles.
Modern Elec. Fixture Co., Cleveland.
Mohrlite Co., San Francisco, Cal.
Monolux Sales Co., New York.
Morgan & Fusco Co., Brooklyn, N. Y.
Morgan & Sons, John, New York (Stained Glass).
Morreau Co., Cleveland, O.
Mosaic Shade Co., Chicago.
National Elec. Fix. Co., Pittsburgh.

Prospects for National MAZDA C Lamps
NO SALE

TAKE any business thorofare after dark. If there are fifty stores in sight, you have fifty prospects for National MAZDA C lamps.

Even the merchant who says: "I have all the light I need", will change his mind after you have equipped his neighbors and competitors with these new business stimulators and his cash register begins to gather rust.

There's only one prospect who's easier to sell than the one who does not use National MAZDA C lamps. He's the man who does use them.

Now is the time and the National MAZDA C is the lamp. The revenue from these lamps is worth going after.

NATIONAL LAMP WORKS
OF GENERAL ELECTRIC CO.
NELA PARK, CLEVELAND
Member Society for Electrical Development—"Do It Electrically"

National Ltg. Products Co., Pittsburgh, Pa.
National Metalizing Co., Garwood N. J.
National Stpg. & Elec. Wks., Chicago
New Era Chandelier Co., Chicago.
New York Gas & Elec. Appliance Co. New York.
New York (N. Y.) Ltg. & Fix. Mfg.
Newark (N. J.) Gas & El. Fixture Co
Nichols Gas Fixture Mfg. Co. Brooklyn, N. Y.
Noe & Sons, Wm. B., N. Y. (Glass)
Nouveau Lamp Co., Lincoln, Cal.
Ornamental Art Metal Wks., N. Y.
Palmer Co., M. S., Boston, Mass.
Pearlman & Co., Victor S., Chicago.
Peerless Chandelier Wks., Greensboro, N. C.
Peoria Elec. Fix. Co., Peoria, Ill.
Phoenix Ltg. Fix. Co., Los Angeles.
Phoenix Light Co., Milwaukee, Wis.
Planet Inc. Lamp Co., New York (Nitrogen Unit).
Polacheck & Bro., Chas., Milwaukee Wis., "Light House."
Post-Glover Elec. Co., Cincinnati, O. "Flam-Bo," unit.
Progressive Fixture & Brass Co. Cleveland, O.
Reading (Pa.) Chandelier Works.
Reed Ware Mfg. Co., Chicago, Ill.
Reliable Art Glass Co., Boston, Mass.
Reliance Mfg. Co., Philadelphia, Pa.
Retherford Bros. Co., Muncie, Ind.
Ribak & Goldberg, New York.
Risinger Mfg. Co., E. Liverpool, O., "Ni-Tro-Lite."
Riviere Brass & Bronze Wks., N. Y.
Roeser & Sommer Co., New York.
Royal Chandelier Wks., Allentown, Pa
Rush Bros., Chicago, Ill.
Safety Lamp & Metal Mfg. Co., Pittsburg, Pa.
Scanlan-Morris Co., Madison, Wis., "Bartlett' Operating Room Lite.
Schaefer Brass & Mfg. Co., St. Louis.
Schroeder Lamp Wks., Edward, New York "Enos."
Scott-Ullman Co., Cleveland, O.
St. Charles (Ill.) Fixture Mfg. Co.
Sechrist Mfg. Co., A., Denver, Col.
Shapiro & Aronson, New York, N. Y., "Arklite," "Salite."
Simes Co., New York, N. Y.
Slocum, E. S., Loda, Ill. (Composition).
Smith Chandelier Co., Detroit, Mich
Standard Brass & Bronze Mfg. Co., Pittsburgh, Pa.
Stavenhagen Co., W. H., New York.
Sterling Bronze Co., New York, N. Y.
Stickley, Gustav, New York, N. Y., "Craftsman."
Stillman-Paine Co., Milwaukee, Wis. (Composition).
St. Louis (Mo.) Brass Mfg. Co
Storsberg, F., Newark, N. J.
Sulzer & Co., Philadelphia, Pa.
Superior Brass & Fixture Co., Chicago, Ill.
Superior Fixture Co., Des Moines.
Tiffany Studios, New York, N. Y.
Tognarelli & Voight Co., Phila., Pa. (Composition).
Toledo Chandelier Mfg. Co., Toledo.
Unique Art Glass & Metal Co., Brooklyn, N. Y.
Utica Brass Wks., Utica, N. Y.
Wahle-Phillips Co., New York, N. Y.
Wakefield Brass Co., Vermillion, O.
Wall, Leo J., Toledo, O.
Wallace Mfg. Co., Chicago, Ill.
Walter, G. E., New York, N. Y. ("Duretta" Plaster Composition).
Warren & Co., Walter G., Chicago.
Western Gas Fixture Co., Toledo, O.
White Co., T. C., St. Louis, Mo., "Dixon."
Wilderman Elec. Co., St. Louis.
Wisconsin El. Const. Co., Milwaukee.
Wyllie China Co., Huntington, W. Va.

FIXTURES, Marine.

Watertight Marine Fixtures, Receptacles, Boxes, Fittings.

BENJAMIN ELECTRIC MFG. CO., 120 So. Sangamon st., Chicago, Ill.
CROUSE-HINDS CO., Syracuse, N. Y. ("Condulet" Waterproof Receptacle).
ELECTRIC APPLIANCE CO., Chicago, Ill. ("Watight" Waterproof Receptacle).
GENERAL ELECTRIC CO., Schenectady, N. Y.
LOVELL & CO., F. H., Arlington, N. J.
RAYMOND ELEC. & MFG. CO., 278 Lycaste ave., Detroit, Mich.

Barre & Co., Joseph, New York.
Conlan Elec. Co., New York (Water Tight Plug and Receptacle).
Durkee & Co., C. D., New York.
Lovell-McConnell Mfg. Co., Newark, N. J.
National Marine Lamp Co., New York.
Newgard & Co., Henry, Chicago, Ill. (Waterproof and Vaporproof Receptacle).
Porter Co., New York, N. Y.
Richardson Brass Co., Edro, Baltimore, Md.
Russell & Stoll Co., New York, N. Y.
V. V. Fittings Co., Philadelphia ("V. V." Waterproof Snap Switch Attachments and Globe Caps).

FIXTURES, Show Case.

BENJAMIN ELECTRIC MFG. CO., 120 So. Sangamon st., Chicago, Ill.
NATIONAL X-RAY REFLECTOR CO., 233 Jackson blvd., Chicago.

Am. Reflector & Ltg. Co., Chicago.
Champion Brass Wks., Coldwater, Mich.
Diamond Show Case Co., Cleveland.
Erickson Elec. Co., L., Boston.
Garden City Plating & Mfg. Co., Chicago, Ill.
Grand Rapids (Mich.) Fixture Co.
Grand Rapids (Mich.) Show Case Co.
Johns-Manville Co., H. W., New York, N. Y., "Linolite."
Klemm & Co., Philadelphia, Pa.
Leveridge, Chas. W., New York, "L. & L."
Overbagh & Ayres Mfg. Co., Chicago, Ill., "Oamco."
Pittsburgh (Pa.) Reflector & Illuminating Co.
Reflector & Hdw. Specialty Mfg. Co., Chicago, Ill., "Taussig."
Straight Filament Lamp Co., New York, "Rayline."
Sunlight Reflector Co., Brooklyn, N. Y.
Weeks, Nelson, Brooklyn, N. Y.
Wheeler Reflector Co., Boston, Mass.

FIXTURES, Street.

For street or any other exterior illumination.

A-A ELEC. MFG. CO., Bridgeport, Ct.
BENJAMIN ELECTRIC MFG. CO., 120 So. Sangamon st., Chicago, Ill.
BRADY ELECTRIC MFG. CO., New Britain, Conn.
CUTTER CO., GEO., 411 Notre Dame st., South Bend, Ind., "Idealite," 'Sollux."
EDISON LAMP WKS. OF GENERAL ELEC. CO., Harrison, N. J., "Novalux."
FEDERAL SIGN SYSTEM (ELECTRIC), Lake & Desplaines sts., Chicago, Ill.
GENERAL ELECTRIC CO., Schenectady, N. Y.
LOVELL & CO., F. H., Arlington, N. J. (Goosenecks).
PETTINGELL-ANDREWS CO., Atlantic ave., Pearl st.-Purchase st., Boston, Mass. (Insulators only).
ROBERTS ELECTRIC SUPPLY CO., H. C., 905 Arch st., Philadelphia.
WESTINGHOUSE ELEC. & MFG. CO., East Pittsburgh, Pa. ("Luxsolite" Unit).

Adams-Bagnall Elec. Co., Cleveland, Ohio, "ABolites."

Fletcher Mfg. Co., Dayton, O.
Harter Mfg. Co., Chicago, Ill.
Klemm & Co., Philadelphia, Pa.
Line Material Co., So. Milwaukee, Wis.
Lundin Elec. & Mach. Co., Boston.
Metropolitan Engrg. Co., New York.
Multi-Lux Co., Cleveland, O.
National Metal Stamping & Mfg. Co., Newark, N. J., "Tidman," Chapin," "Columbia," "Martin," "Jersey," "Murray," "Tuxedo," "Tremont."
Overbagh & Ayres Mfg. Co., Chicago, Ill., "Oamco."
Phila.-Elec'l & Mfg. Co., Phila., Pa.
Pittsburgh (Pa.) Transformer Co.
Walworth Mfg. Co., Boston, Mass. (Goosenecks).
Wheeler Reflector Co., Boston, Mass.

FIXTURES, Wood.

DAISY WOODCRAFT CO., Faribault, Minn.
IDEAL LAMP MFG. CO., Faribault, Minn.

Brown Co., W. B., Bluffton, Ind.
Lamb Bros. & Greene, Nappanee, Ind.

FLASHERS, Sign.

BETTS & BETTS CORPORATION, 258 W. 55th st., New York, N. Y., "Vacu," "Kilark," "Irdite."
CAMPBELL ELECTRIC CO., Lynn, Mass.
PHELPS MFG. CO., Detroit, Mich. (Motorless "Skeedoodle"), "Surewink."
REYNOLDS ELECTRIC CO., 422 So. Talman ave., Chicago, Ill., "Reco."

Brown Flasher & Mfg. Co., Los Angeles, Cal.
Electric Flasher Co., New York, N. Y., "Universal."
Farr Tele. & Construction Supply Co., Chicago, Ill., "D. & L."
Kelley & Kelley, Jersey City, N. J., "Thermo-Blink," "Tic-Tac," "Projectoscope."
Reynolds Dull Flasher Co., Chicago, Ill., "Dulls."
Ryan Co., M. C., Phoenix, N. Y.
Schneider & Co., C. O., Chicago, Ill., "Firefly."

FLASHLIGHT CASES.—See Cases.
FLASHLIGHT LENSES.
See Lenses, Flashlight.

FLASHLIGHTS,

Candles.
Cap Lights.
Lanterns.
Flash Pencils.
Lamps.
Searchlights.
Hand Lamps

AMERICAN EVER READY WKS. OF NAT'L CARBON CO., Long Island City, N. Y., "Eveready."
ANGLO-AMERICAN CO., Pittsburgh, Pa.
BEACON MINIATURE ELEC. CO., 118 Duane st., New York, N. Y., "Fountainlight," "Friar's Lantern."
BURCHWELL MFG. CO., Pontiac Bldg., St. Louis, Mo., "Bright Eye."
BRIGHT STAR BATTERY CO., New York, N. Y.
CENTRAL TELE. & ELEC. CO., 310 N. 11th st., St. Louis, Mo., "Practel-lite."
FEDERAL SIGN SYSTEM (ELECTRIC), Lake & Desplaines sts., Chicago, Ill. (Lanterns).
HANDY-ANDY ELEC. CO., 9 So. Clinton st., Chicago, Ill.
HAWTHORNE MFG. CO., INC., 9 Spruce st., Bridgeport, Conn.
ILLUMINATING ELEC. MFG. CO., Philadelphia, Pa., "Daylite" Lantern.
IMPORT SALES CO., 19 E. 21st st., New York, N. Y. (Imp.), "Stik-O-Lite."
INTERSTATE ELEC. NOVELTY CO., 29 Park pl., New York, "Franco."
ISGOLD MFG. CO., 107 East 17th st., New York, N. Y.
LINCOLN ELEC. HTG. APPLIANCES, INC., 112 W. Adams st., Chicago, Ill. (Flash Pencil). "Vademecum," "Stayslit."
MANHATTAN ELEC'L SUPPLY CO., 17 Park pl., New York, N. Y., "Redsealite."
METAL SPECIALTIES MFG. CO., 748 W. Monroe st., Chicago, Ill., "Presto."
PROVIDENCE ELECTRIC MFG. CO., Providence, R. I., "Little Rhody," "Nitelite."
SCHAFFER CO., MAX, 26 Warren st., New York, N. Y. (Imp.).
STANDARD ELEC. NOVELTY CO., 10 N. Desplaines st., Chicago, Ill., "Pen-Electro-Lite."
STANLEY & PATTERSON, 23 Murray st., New York, N. Y., "Matchless."
USONA MFG. CO., 1 Hudson st., New York, N. Y., "Kwik-Lite."
WOOD ELEC. CO., C. D., 136 Liberty st., New York N. Y., "Boy Scout."
YALE MFG. CO., 18 S. Clinton, Chicago, Ill.
American Carbon & Battery Co., East St. Louis, Ill.
Attacho Light Co. St. Louis, Mo.
Baker-Smith Co., San Francisco, Cal., "Bella" Electric Candle.
Bass-Moody Co., Peoria, Ill. ("Step-O-Lite" Battery Lantern).
Connelly Iron Sponge & Governor Co., New York ("Monarch" Meter Reading Lamps).
Concordia Safety Lamp Co., Pittsburgh, Pa. ("Ceag" Mine Lamp).
Delta Elec. Co., Marion, Ind.
Edison, Inc., Thos. A., Orange, N. J.
Electrocraft Co., Philadelphia, Pa., "Time-O-Nite," "Pathfinder."
Electro Importing Co., New York (Imp.).
Halladay Co., L. P., Streator, Ill., "Da-Lite."
Hansen, Marvin W., Toledo, O.
Harvey, W. A., Scranton, Pa.
Hipwell Mfg. Co., Pittsburgh, Pa. ("Hipcoscope" Elec. Hand Lanterns).
Hirsch Elec. Mine Lamp Co., Phila.
Hytees Factories, Inc., Indianapolis, Ind., "Dads."
Kruschac, R. C., Duluth, Minn.
Marcuson, E., New York, N. Y., "Knockabout."
Merchant Engineers Corp., New York. "Jove" Battery Lantern.
Niagara Searchlight Co., Niagara Falls, N. Y. (Storage Battery, Cap Lights).
Northwestern Storage Battery Co., Milwaukee, Wis.
Portable El. Safety Lt. Co., Newark, N. J. ("Hubbell" Storage Battery).
Radium Light Co., Pittsburgh, Pa.
Rall, Frederick, New York, "Wonderlite."
Reflex Inspection Light Co., Mt. Vernon, N. Y.
Shepard Dry Battery Co., S. S., Boston (Tungsten and Carbon).
Solar Light Co., New York. (Imp.).
Stelling Mfg. Co., Port Washington, Wis. ("Simplex" Lantern).
Stewart & Skinner Co., Worcester, Mass. ("Meteor," "Lightning Bug" Elec. Lanterns).
Tardie, E. J., New York, N. Y.
Thayer & Co., R. L., Chicago, Ill., "Jenks."
Universal Novelty Co., New York, N. Y., "Eclipse," "Milwaukee."
Usona Mfg. Co., Toledo, O.
Vesta Accumulator Co., Chicago, Ill. (Storage Battery).
Voltamp Elec. Mfg. Co., Baltimore.
Willard & Craword Co., Minneapolis, Minn. (Elec. Hand Lanterns).
Witherbee Igniter Co., Springfield, Mass., "Wico" Cap Light.
Williamson Co., A. L., New York.
Wolf Safety Lamp Co. of America, New York (Mine Lamp).

FLASK HEATERS.
See Heaters, Liquid.
FLAT IRONS—See Irons, Sad.
FLAT RATE CONTROLLERS.
See Controllers, Flat Rate.
FLEXIBLE TUBING.
See Tubing, Flexible.
FLOAT SWITCHES.
See Switches, Tank.
FLOOR BOXES—See Boxes, Floor.
FLOOR POLISHERS.
See Cleaners and Polishers.
FLOOR TREADS AND PUSHES.
See Treads, Floor.
FLOWERS AND PLANTS.
See Decorative Lighting.
FLUORESCOPES. — See Electro Therapeutical Apparatus.
FLUSH PLUGS.
See Plugs & Receptacles, Flush
FLUX.—See Soldering Compounds.
FOOT W[illegible]ERS.—See Warmers.
FORKS, [illegible]EY.
See [illegible]and Forks.

FORMERS, Tie Wire.

Chance Mfg [illegible]ralia, Mo.
Only Mfg. Co. Mo[illegible] Iowa.

FORMS, ARMAT[illegible].
See Machines, [illegible]

FOUNTAINS, Elect[illegible]

Darlington, F. W., Philad[illegible]
Electric Fountain Co., New
Feature Adv. Co., New York.

FREEZERS, Ice Cream.

(Motor Driven.)

DEWSBERRY, R. A., 1008 West Lake st., Chicago, Ill.

Clad & Sons, V., Philadelphia, Pa., "Advance," "Eureka," "Excelsior."
Emery Thompson Machine & Supply Co., New York.
Mills & Bro., Phila., "Monitor."
Peerless Freezer Co., Winchendon, Mass., "Dana."
Tyson Co., Canton, O.
Whitney Co., F. E., Boston, Mass.

FREQUENCY METERS.
See Instruments, Indicating.
FRINGES.—See Crystals.
FROSTING.
See Coloring, Inc. Lamp.
FRYING PANS.—See Cooking.
FULLER BOARDS—See Paper, Insulating.
FUMIGATORS.—See Perfumers.

FURNACES, Electric.

(Annealing, Melting, Refining, Steel.)

Elec. Htg. Apparatus Co., New York, N. Y., "Multiple Unit."
Electric Metals Co., Indianapolis, Ind.
Hoskins Mfg. Co., Detroit, Mich.
Leavitt & Co., C. W., New York, N. Y., "Girdo."
Metallurgic Engineering Co., Chicago, Ill., "Snyder."
Pittsburg (Pa.) Electric Furnace Co.
Thomas Co., Arthur H., Phila., Pa.

FURNACES, SOLDERING.
See Torches and Furnaces.
FUSE BLOCKS.—See Cut-Outs.
FUSE BOXES — See Boxes, Cast Iron; also Boxes, Manhole; also Cabinets, Sheet Steel.
FUSE PLUGS.—See Plugs, Fuse.
FUSE PLUG PULLERS.
See Tongs.
FUSE TESTER—See Testers, Fuse.
FUSE WIRE—See Wire, Fuse.

FUSES, Automobile, Enclosed

BUSSMAN MFG. CO., St. Louis, Mo., "Buss."
CHICAGO FUSE & MFG. CO., Chicago, Ill.
CONDIT ELECTRICAL MFG. CO., Boston, Mass., "Shawmut."
DETROIT FUSE MFG. CO., 1411 Rivard st., Detroit, Mich.
KILLARK ELEC. MFG. CO., St. Louis, Mo. (W. Douglas Woolley, Gen. Sales Representative, 30 N. Michigan blvd., Chicago, Ill.

Harvard Electric Co., Chicago, Ill.
Johns-Manville Co., New York.

FUSES, BLASTING.—See Blasting.

FUSES, Enclosed.

Standard—Refillable—High Potential.

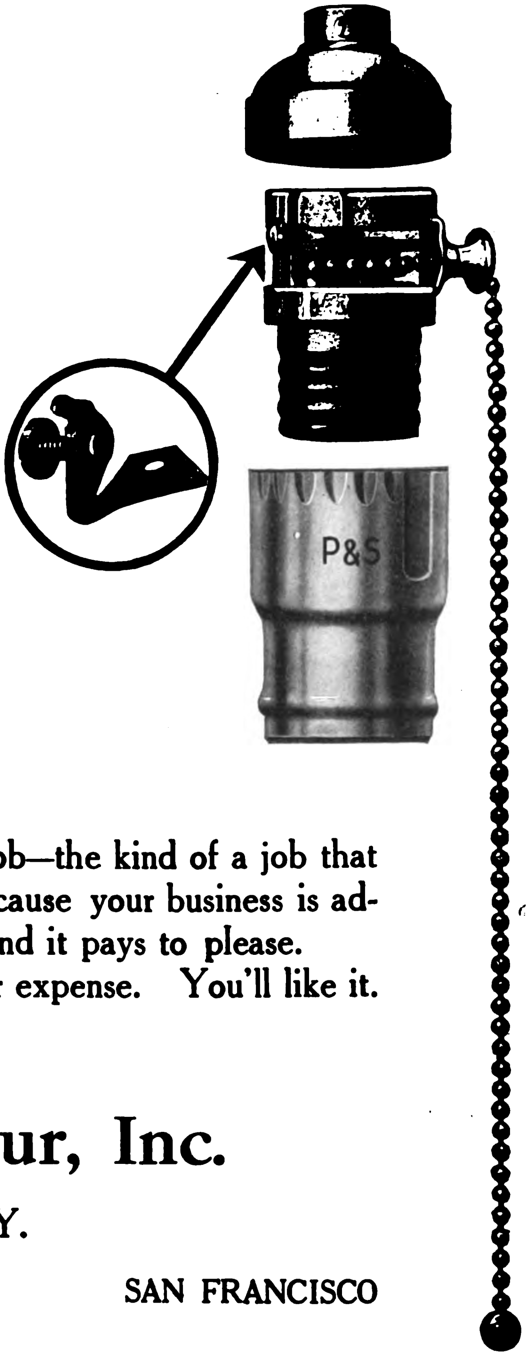
BRYANT ELECTRIC CO., Bridgeport, Conn.
BUSSMAN MFG. CO., St. Louis, Mo., "Buss."
CHELTEN ELEC. CO., Philadelphia, Pa.
CHICAGO FUSE & MFG. CO., Chicago, Ill., "Union."
CONDIT ELECTRICAL MFG. CO., Boston, Mass., "Shawmut."
CONNECTICUT ELECTRIC MFG. CO., Connecticut and Florence aves., Bridgeport, Conn.
DAUM O., A. F., Pittsburgh, Pa. (Refillable) "Ideal" Fuses & Strips.
D. & W. FUSE CO., Providence, R. I.
DETROIT FUSE MFG. CO., 1411 Rivard st., Detroit, Mich., "Arkless."
ECONOMY FUSE & MFG. CO., Kinzie and Orleans sts., Chicago, Ill. (Renewable).
ELECTRIC FUSEGUARD CO., Newark, N. J.
GENERAL ELECTRIC CO., Schenectady, N. Y.
KILLARK ELEC. MFG. CO., St. Louis, Mo. (W. Douglas Woolley, Gen. Sales Representative, 30 N. Michigan blvd., Chicago, Ill.
MULTI REFILLABLE FUSE CO., 723 Fulton st., Chicago, Ill. (Refillable).
TRUMBULL-VANDERPOEL ELEC. MFG. CO., Bantam, Conn.

Barbaro Elec'l Mfg. Co., Belleville, Ill. ("Ree-fil-Bel" Refillable).
Chemelectric Co., Chicago, Ill., "S. & C." High Potential.
Columbia Mach. Wks. & Malleable Iron Co., Brooklyn, N. Y. ("N. W." Renewable).
Commercial Enclosed Fuse Co., Hoboken, N. J.

THREE REASONS that are BUSINESS-LIKE, LOGICAL & SOUND—WHY YOU SHOULD USE

P & S

Handy Electric Wiring Devices



1. **Handy to Stock:**

   Each part fits the rest—Interchangeability of material gives the Maximum efficiency with the Minimum parts—Stock Keeping Economy.

2. **Save Time:**

   The Connections are quick to reach—roomy. The Interior is quick to wire—up-set screws. The Shell is quick to open—snaps in place to hold. On these points depend the Saving of Time.

3. **Satisfy Your Customer:**

   P & S Material fits the first-class job—the kind of a job that guards your business against loss, because your business is advertised by your satisfied customer, and it pays to please. Get a Sample NOW—try it at our expense. You'll like it.

Pass & Seymour, Inc.

SOLVAY, N. Y.

NEW YORK CHICAGO SAN FRANCISCO

Delta Star Elec. Co., Chicago, Ill. (High Potential).
Great Western Re-Fillable Fuse Co., Pittsburgh, Pa. (Refillable).
Ideal Fuse Co., San Francisco, Cal. (Refillable).
Johns-Manville Co., H. W., New York, N. Y., "Noark."
Kirkman Engrg. Corp., New York. "K. E."
Metropolitan Engrg. Co., New York (High Potential).
Monarch Refillable Fuse Co., Buffalo.
Nat'l Refillable Fuse Co., Chicago, Ill. (Refilled).
Pacific Elec. & Mfg. Co., San Francisco, Cal. (High Potential).
Railway & Industrial Engineering Co., Greensburg, Pa. (High Potential).
Rochester Refill Fuse Co., Rochester.
Snow & Co., E. W., Rochester, N. Y. (Refillable and Standard).
Star Fuse Co., New York, N. Y. (Renewable).

FUSES, Open Link.

With Copper Terminal; also Aluminum.

CHICAGO FUSE MFG. CO., Chicago, Ill., "Union."
CONDIT ELECTRICAL MFG. CO., Boston, Mass. ("Shawmut" Links and Terminals).
GENERAL ELECTRIC CO., Schenectady, N. Y.
MULTI REFILLABLE FUSE CO., 723 Fulton st., Chicago, Ill.

Hartwig Co., Wm. J., Detroit, Mich.
Harvard Electric Co., Chicago, Ill. "Greer."
Harvey, W. A., Scranton, Pa. (Emergency).
Mazanek, B., New York, N. Y. (Links and Terminals).
Metropolitan Engrg. Co., New York.
Schutz Mfg. Co., Chicago, Ill., "N-C" Line Fuse.
Walker Elec. Co., Phila., Pa. (Aluminum).

FUSES, Telephone

Mica—Glass—Heat Coils—Protectors.

CENTRAL TELE. & ELEC. CO., 310 N. 11th st., St. Louis, Mo., "Gilgen."
RELIABLE ELECTRIC CO., Chicago, Ill., "Veribest," "Blow-Rite."

Cook, F. B., Chicago.
Hall, Frank B., Newton Falls, O. (Mica).

GALVANOMETERS.
See Instruments, Testing.
GARAGE PUMPS.
See Pumps, Tire.
GARMENT PRESSES.
See Heating Devices, Special.
GAS BURNERS.
See Burners, Gas Lighting.
GAS ENGINES—See Engines, Gas.
GAS FIXTURE ATTACHMENTS.
See Attachments, Gas Fixture.
GAUGE BATTERY.
See Instruments, Pocket.

GAUGES, Hack Saw

(For Cutting Conduit.)

Millers Falls (Mass.) Co.

GAUGES, Wire.

Brown & Sharpe Mfg. Co., Providence, R. I.
Novelty Electric Co., Philadelphia, Pa., "Neco." "Pallette."
Starrett & Co., L. S., Athol, Mass.
Vulcan Hdw. Co., Carlstadt, N. J.

GEAR SHIFTERS, AUTO.
See Shifters, Gear, Automobile.
GENERATING SETS.
See Plants, Lighting.

GENERATORS, Automobile Lighting and Starting.

Generators—Motors.

CARLETON CO., 174 Summer st., Boston, Mass., "Porcupine."
CLEVELAND ARMATURE WKS., 49th and St. Clair ave., Cleveland, O.
DIEHL MFG. CO., Elizabeth, N. J.
EMERSON ELEC. & MFG. CO., 2032 Washington ave., St. Louis
FORT WAYNE ELEC. WKS. OF G. E. CO., Ft. Wayne, Ind.
GENERAL ELECTRIC CO., Schenectady, N. Y.
WAGNER ELEC. MFG. CO., St. Louis, Mo.
WESTINGHOUSE ELEC. & MFG. CO., East Pittsburgh, Pa.

C. & C. El. & Mfg. Co., Garwood, N. J.
Fisher Elec. Wks., Detroit, Mich.
Hertner El. & Mfg. Co., Cleveland.

GENERATORS, Electro-Plating.

FIDELITY ELEC. CO., Lancaster, Pa.
HOLTZER-CABOT ELECTRIC CO., Boston, Mass.
KENDRICK & DAVIS CO., Lebanon, N. H.
ROCHESTER MOTORS CO., 686 Lexington ave., Rochester, N. Y.

Bennett-O'Connell Co., Chicago, Ill.
Bishop, W. S., New Haven, Conn.
Boissier Elec. Co., New York, N. Y.
Bogue Electric Co., Chas. J., N. Y.
Connecticut Dynamo Motor Co., Irvington, N. J.
C & C El. Mfg. Co., Garwood, N. J.
Eager Electric Co., Watertown, N. Y.
Electric Machinery Co., Minneapolis.
Electric Specialty Co., Stamford, Ct.
Hanson & Van Winkle, Newark, N. J.
Ideal Elec. & Mfg. Co., Mansfield, O.
Jantz & Leist Elec. Co., Cincinnati.
L'Hommedieu & Sons Co., Chas., Chicago, Ill.
Munning-Loeb Co., Matawan, N. J., "Optimus."
Pan Electric Mfg. Co., St. Louis, Mo., "Chandeysson."
U. S. Elec. Mfg. Co., Los Angeles.
Victor Elec. Co., Chicago, Ill.

GENERATORS, Lighting & Power.

BELL ELEC. MOTOR CO., Garwood, N. J.
BISSELL CO., F., Toledo, O. (Sewing Machine Motors).
BODINE ELEC. CO., Oakley blvd. & Ohio st., Chicago, Ill.
CROCKER-WHEELER CO., Ampere, N. J.
DIEHL MFG. CO., Elizabeth, N. J.
ECK DYNAMO & MOTOR CO., Belleville, N. J.
FIDELITY ELEC. CO., Lancaster, Pa., "Eclipse."
FORT WAYNE ELECTRIC WORKS OF GENERAL ELEC. CO., 1612 Broadway, Fort Wayne, Ind., "Northern."
GENERAL ELECTRIC CO., Schenectady, N. Y.
HOLTZER-CABOT ELECTRIC CO., Boston, Mass.
LINCOLN ELECTRIC CO., 38th st. and Kelley ave., Cleveland, O.
MECHANICAL APPLIANCE CO., Milwaukee, "Watson," "B. T."
PEERLESS ELECTRIC CO., Warren, Ohio.
ROBBINS & MYERS CO., Springfield, O., "Standard."
ROCHESTER MOTORS CO., 686 Lexington ave., Rochester, N. Y.
ROTH BROS. & CO., 1396 W. Adams st., Chicago, Ill.
SPRAGUE ELEC. WORKS OF GENERAL ELEC. CO., 527 W. 34th st., New York, N. Y., "Lundell."
WAGNER ELECTRIC MFG. CO., St. Louis, Mo.
WESCHE ELEC. CO., B. A., Cincinnati, O., "Swing."
WESTERN ELECTRIC CO., New York, N. Y.
WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa.

Allis-Chalmers Mfg. Co., Milwaukee, Wis., "Bullock."
American Rotary Valve Co., Anderson, Ind., "Jenney."
Benton Elec. Co., La Crosse, Wis.
Bogue Electric Co., Chas. J., N. Y.
Burke Electric Co., Erie, Pa.
Colonial Fan & Motor Co., Warren, O.
C. & C. El. & Mfg. Co., Garwood, N. J.
Eager Elec. Co., Watertown, N. Y.
Electric Machinery Co., Minneapolis.
Electric Specialty Co., Stamford, Ct.
Engberg's Electrical & Mechanical Works, St. Joseph, Mich.
Fairbanks, Morse & Co., Chicago.
Ideal Elec. & Mfg. Co., Mansfield, O.
Imperial Elec. Co., Akron, O.
Jantz & Leist Elec. Co., Cincinnati.
Kentucky Elec'l Co., Owensboro, Ky.
Kester Elec. Co., Terre Haute, Ind.
Northwestern Mfg. Co., Milwaukee.
Olson-Boettger Elec. Mfg. Co., St. Paul, Minn.
Pan-Electric Mfg. Co., St. Louis, Mo., "Chandeysson."
Reliance Elec. & Engng. Co., Cleveland, O.
Reno-Kaetker Elec. Co., Cincinnati, O.
Ridgway Dynamo & Engine Co., Ridgway, Pa., "Thompson-Ryan."
Star Dynamo Wks., Jefferson City, Mo.
Triumph Elec. Co., Cincinnati, O.
U. S. Electrical Mfg. Co., Los Angeles, Cal., "Usemco."
Victor Elec. Co., Chicago, Ill.

GENERATORS, MOTOR.
See Motor-Generators.
GENERATORS, TELEPHONE.
See Telephones & Switchboards.
GERMAN SILVER WIRE.
See Wire, Resistance.
GLASS CLEANERS.
See Cleaners, Globe & Shade.
GLASS MOUTHPIECES.
See Mouthpieces, Tele.
GLASSWARE.—See Shades, Glass.
GLOBE BRUSHES.
See Brushes, Globe.
GLOBE CLEANERS.
See Cleaners, Globe & Shade.

GLOBES, Arc Light.

GILL BROS. CO., 225 Parian Bldg., Steubenville, O.
GLEASON-TIEBOUT GLASS CO., 71 W. 23d st., New York, N. Y.
MACBETH-EVANS GLASS CO., Pittsburgh, Pa.

Gill & Co., Philadelphia, Pa.
Gillinder & Sons, Philadelphia, Pa.
Haskins Glass Co., Martins Ferry, O.
Holophane Wks. of General Elec. Co., Cleveland, O.
Jefferson Glass Co., Follansbee, W. Va.
Libbey Glass Co., Toledo, O.
Lippincott Glass Co., Alexandria, Ind.
Mound Valley (Kans.) Glass Mfg. Co.
Phoenix Glass Co., New York.
Wellington Glass Co., Cumberland, Md.

GLOBES, GLASS.
See Shades, Glass.
GLOVE DRIERS.
See Driers, Glove.

GLOVES, Automobile Signal.

Schindler, Chas. A., West Hoboken, N. J.

GLOVES, Electrically Heated.

Carron & Co., New York, N. Y.

GLOVES, Linemen's.

Leather—Rubber—Buckskin.

Aetna Rubber Co., Cleveland, O.
Alliance Rubber Co., Alliance, O.
Canton Rubber Co., Canton, O.
Chicago (Ill.) Glove & Mitten Co.
Faultless Rubber Co., Ashland, O., "Hi-Test," "Hi Voltage" Rubber
Goodrich Co., B. F., Akron, O.
Goodyear's India Rubber Glove Mfg. Co., New York, N. Y.
L. & M. Rubber Co., Carrollton, O. (Buckskin).
Miller Rubber Co., Akron, O.
Morison-Riker Mfg. Co., Grinnell, Ia., "Resistal."
Rubber Products Co., Barberton, O.
Star Rubber Co., Akron, O.

GLUE POTS—See Pots, Melting.
GONGS, ELECTRO-MECHANICAL.
See Bells, Elec.

GONGS, Unmounted, Shells.

PLUME & ATWOOD MFG. CO., Waterbury, Conn.

American Tube & Stamping Co., Bridgeport, Conn.
Bevin Bros. Mfg. Co., East Hampton, Conn., "Barton."
Bridgeport (Conn.) Brass Co.
Catasauqua Gong & Stamping Works, Catasauqua, Pa.
East Hampton (Conn.) Bell Co.
Gong Bell Mfg. Co., East Hampton, Conn.
Hill Brass Co., East Hampton, Conn.
Reiter, G. C., Canton, O.
Star Bros. Bell Co., East Hampton, Conn.
Waterbury Mfg. Co., Waterbury, Ct.

GONGS & BELLS, Street Car.

WALL SUPPLY MFG. CO., 507 Preble ave., Pittsburgh, Pa.

Adams & Westlake Co., Chicago, Ill.
Bevin Bros. Mfg. Co., East Hampton, Conn.
Brill Co., J. G., Philadelphia, Pa., "Dedenda."
Dayton Mfg. Co., Dayton, O.
Electric Service Supplies Co., Philadelphia ("Keystone" Pneumatic).
Ohio Brass Co., Mansfield, Ohio.
Pressed Steel Tank Co., Milwaukee, Wis. (Steel).
Reiter, G. C., Canton, O.
Ross-Mehan Fdry. Co., Chattanooga.
St. Louis Car Co., St. Louis, Mo.
Starr Bros. Bell Co., East Hampton, Conn.

GOOSENECKS.
See Fixtures, Street.

GOVERNORS, Water Wheel.

Holyoke Mach Co., Worcester, Mass.
Lombard Gov. Co., Ashland, Mass.
Ludlow Valve Mfg. Co., Troy, N. Y., "Sturgess."
Woodward Gov. Co., Rockford, Ill.

GRAPHIC METERS.
See Instruments, Recording.

GRAPHITE.

DIXON CRUCIBLE CO., JOSEPH, Jersey City, N. J.

Asbury Graphite Mills, Asbury, N. J.
Elk Graphite Mlng. Co., St. Marys, Pa.
International Acheson Graphite Co., Niagara Falls, N. Y.
U. S. Graphite Co., Saginaw, Mich.
Wisconsin Graphite Co., Stevens Point.

GRAPHOMETERS.
See Instruments, Integrating.
GRIDDLES. See Cooking Utensils.
GRIDS.—See Units, Rods & Grids.
GRINDERS, COFFEE.
See Mills, Coffee.
GRINDERS, PORTABLE.
See Tools, Portable Hand.

GRIPS, Cable.

Havens, Harold A., Syracuse, N. Y.
Universal Cable Grip Co., Syracuse.

GRIPS, Lamp.

BENJAMIN ELECTRIC MFG. CO., 120 So. Sangamon st., Chicago, Ill.

GRIPS, Strain Relief.

Rosette & Socket.

STEWART ELEC. CO., F. H., 37 N. 7th st., Philadelphia, Pa., "Knostrain."
WEBER ELECTRIC CO. (Henry D. Sears, General Sales Agent, 131 State st., Boston, Mass.).

GROUND DETECTORS.
See Instruments, Indicating.
GROUND ROD PULLERS.
See Pullers, Rod, Ground.

GROUNDING DEVICES.

FAIRMOUNT ELECTRIC & MFG. CO., Philadelphia, Pa., "Maxum."
FEDERAL SIGN SYSTEM (ELECTRIC), Lake & Desplaines sts., Chicago (Cartridge Ground Plates).

Arrow Conductor & Mfg. Co., Chicago.
Brach Supply Co., L. S., Newark, N. J. "Hydro-Ground."
Cope, T. J., Philadelphia, Pa. (Attaching Plates).
Dossert & Co., New York, N. Y.
Hickey & Schneider, New York (Insulator).
Lord Mfg. Co., Brooklyn, N. Y., "Hydro-Ground."
Paragon Elec. Co., Chicago, Ill. (Ground Cones).

GUARDS, ARC LAMP.
See Nets & Guards.

GUARDS, Inc. Lamp.

BENJAMIN ELECTRIC MFG. CO., 120 So. Sangamon st., Chicago, Ill. (Fibre).
HUBBELL, INC., HARVEY, Bridgeport, Conn. (Reflector).
McGILL MFG. CO., 39 Oak st., Valparaiso, Ind., "Wagor," "Protector," "Loxon," "Bull Dog."
MATTHEWS & BRO., W. N., 3705 Forest Park blvd., St. Louis, Mo., "Holdfast."
MORSE, FRANK W., Boston, Mass.

Gail-Webb Mfg. Co., Buffalo, N. Y.
Russell & Stoll Co., New York, N. Y.
Standard Wire Co., Newcastle, Pa.
V. V. Fittings Co., Philadelphia, Pa., "Midget."
Wire Goods Co., Worcester, Mass.

GUARDS, Lecking.

HUBBELL, INC., HARVEY, Bridgeport, Conn.
McGILL MFG. CO., 39 Oak st., Valparaiso, Ind., "Loxon."
MORSE, FRANK, Boston, Mass., "Never Break."

Leveridge, Charles W., New York.
Sorensen, P., Brooklyn, N. Y.

GUARDS, MANHOLE.
See Covers & Guards.

GUARDS, Portable Lamp.

(For Automobile Trouble Hunters. See Lamps, Trouble.)

BENJAMIN ELECTRIC MFG. CO., 120 So. Sangamon st., Chicago, Ill.
GENERAL ELECTRIC CO., Schenectady, N. Y.
LOVELL CO., F. H., Arlington, N. J.
McGILL MFG. CO., 39 Oak st., Valparaiso, Ind., "Security," "Bull Dog," "Improved Protector," "London," "Standard A." "National," "Gripson," "Imperial," "Safety."
MORSE, FRANK W., Boston, Mass., "Eureka," "Harvard."

Electric Service Supplies Co., Philadelphia, Pa., "Keystone."
Harvard Electric Co., Chicago, Ill.
Novelty Electric Co., Philadelphia, Pa. (Bung Hole Lamp and Guard).
Robb & Blackmer, Boston, Mass.
Wells Light Mfg. Co., Jersey City.

GUARDS, Trolley Wheel.

Automatic Trolley Guard Co., Buffalo.
Elec. Service Supplies Co., Phila., Pa.
Lord Mfg. Co., Brooklyn, N. Y.
Ohio Brass Co., Mansfield, O., "National."

GUY ANCHORS & RODS.
See Anchors, Guy.
HACK SAW GAUGES.
See Gauges, Hack Saw.
HAIR DRIERS & SINGERS.
See Driers, Hair & Shoe.
HAIR SPRINGS. See Springs, Hair.
HAIR WAVERS.
See Wavers, Hair.
HAMMERS, ELEC.
See Tools, Portable Hand.
HANDLES, SOCKET.
See Guards, Portable Lamp.

HANDLES, Wood

For Switches or Sad Irons.

Allen, Chas. E., Pequabuck, Conn.
American Enamel Co., Providence.
American Wood Working Co., Chicago.
Bogert & Hopper, New York, N. Y.
Brown's Enamel Wks., Fitchburg, Mass.
Detroit Handle Co., Detroit, Mich.
Eastern Wood Working Co., Wallingford, Conn.
Eby & Co., F. B., Detroit, Mich.
Estes & Sons, E. B., New York, N. Y.
Fitchburg Enamel Co., Fitchburg, Mass.
Fuller, J. J., Westfield, Mass.
Mossman Wood Turning Co., Fitchburg, Mass.
Narragansett Mach. Co., Providence.
Ober Mfg. Co., Chagrin Falls, Ohio.
Royal Enamel Co., Fitchburg, Mass.
Novelty Turning Co., Norway, Me.
Sun Enamel Wks., Leominster, Mass.

ELECTRICAL SPECIALTIES

"UNION" ROSETTES AND RECEPTACLES

STANDARD MATERIAL

UNION MADE MEANS WELL MADE

"Union" Switch Block No. 951

UNION ROSETTES

No.
762 One Piece Rosette
765 Two " " Cleat
766 " " " Moulding
767 " " " Connected

763 Cleat Rosette with covered contact ½" base
764 " " " " " 1" "

"Union Two Piece Rosette No. 765

No. 511

"Union" Cleat Rosette No. 764

UNION RECEPTACLES

"Union" Screw Receptacle No. 755

No.
757. Cleat Receptacle with ½" base and without Shade Holder.
758. Cleat Receptacle with ½" base for Shade Holder.
759. Cleat Receptacle with 1" base for Shade Holder.

760. Moulding Receptacle without Shade Holder.
761. Moulding Receptacle for Shade Holder.

No. 514

"Union" Mogul Wall Receptacle No. 526

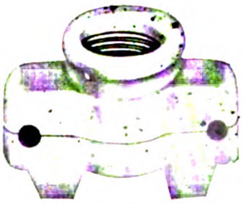
"Union" Conduit Receptacle No. 965

754. Screw Type Flush Receptacle Complete
755. " " " " Only
756. " " " " Plate

765. Conduit Receptacle complete with cover.
700. Sign Receptacle.
702. " " Extra Heavy Lugs.

No. 516

No. 522 Mogul Socket ⅜" Cap



"Union" Cleat Receptacle No. 759

507. Brass Shell Closed Base Key Receptacles
508. " " Open " " "
557. " " Closed " Keyless "
558. " " Open " " "

No. 562

UNION ELECTRIC COMPANY

TRENTON, N. J.

District Sales Agents

788 Mission St.,
SAN FRANCISCO, CAL.

Am. Trust Bldg.,
BIRMINGHAM, ALA.

1403 Chestnut St.,
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213 E. Jefferson St.,
DETROIT, MICH.

1523 Badger St.,
LA CROSSE, WIS.

DENVER, COL.

BUFFALO, N. Y.

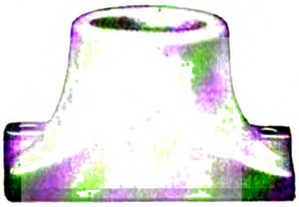
CHICAGO, ILL.

No. 503

"Union" Cleat Receptacle No. 758

"Union" Rosette No. 763

"Union" Moulding Receptacle No. 761



"Union" Moulding Receptacle No. 760

HANGERS, Arc Lamp

Hangers—Insulated Hangers—Automatic Couplings—Insulators—Windlasses—Pulleys—Safety Pulleys—Hangerboards.

ANDERSON MFG. CO., ALBERT & J. M., Boston, Mass.
BRADY ELEC. MFG. CO., New Britain, Conn.
COMMERCIAL ELEC'L SUPPLY CO., St. Louis, Mo. (Eddy Windlass).
CUTTER CO., GEO., 411 Notre Dame st., South Bend, Ind., "Jupiter."
GENERAL ELECTRIC CO., Schenectady, N. Y.
MACALLEN CO., Macallen & Foundry sts., Boston, Mass.
MORRIS, ELMER P., 136 Liberty st., New York.

Ayer, F. H., Chicago, Heights, Ill. (Windlasses).
Creaghead Engrg. Co., Cincinnati.
Eddy Windlass Co., Webster Grove, Mo.
Electrical Construction Supply Co., Springfield, O.
Electrose Mfg. Co., Brooklyn, N. Y.
Fletcher Mfg. Co., Dayton, O.
Hebendahl Co., J. P., Elizabeth, N. J.
Johns-Manville Co., H. W., New York.
Line Material Co., So. Milwaukee, Wis.
Manchester Sales Co., Buffalo, N. Y.
National Sewing Machine Co., Belvidere, Ill., "Belvidere," "Mayo."
Thompson El. Co., Cleveland, O. (Cutout Hangers).

HANGERS, Cable.

APPLETON ELECTRIC CO., 212 N. Jefferson st., Chicago, Ill.
BISSELL CO., F., Toledo, O.
CONDIT ELECTRICAL MFG. CO., Boston, Mass. ("Boston").
EUREKA SUPPLY CO., Sewell, N. J., "Rex."
HUBBARD & CO., Pittsburgh, Pa.
LANZ & SONS, M., Pittsburgh, Pa.
MATTHEWS & BRO., W. N., 3705 Forest Park blvd., St. Louis, Mo.
MORSE, FRANK W., Boston, Mass.
NATIONAL TELEPHONE SUPPLY CO., Cleveland, O. ("Universal" and "Non-breakable" Messenger Hangers, "Marlin," "Pierce" and "Swisher" Cable Hanger), Aerial Cable Rings.
PETTINGELL-ANDREWS CO., Atlantic ave.-Pearl st.-Purchase st., Boston, Mass., "O'Neill."
RELIABLE ELECTRIC CO., Chicago, Ill., "Davidson."
STANDARD UNDERGROUND CABLE CO., Pittsburgh, Pa., "Nordyke Support."
STEEL CITY ELEC. CO., 1207 Columbus ave., Pittsburgh, Pa., "Marchand."

Adams Mfg. Co., H. E., Pittsburgh.
Aurora Cable Clip Co., Aurora, Ill.
Baugh Cable Clip Co., Hopkinsville, Ky.
Cameron Appliance Co., Everett, Mass., "Metropolitan."
Cook, F. B., Chicago, Ill.
Copeland, H. P., New York, "H-P."
Diamond Expansion Bolt Co., New York, N. Y., "Long Saut."
Electrical Appliance Corporation, Philadelphia, Pa., "Krips-Wright."
Hallett Iron Works, Harvey, Ill.
Harvard Electric Co., Chicago, Ill.
Lingle Mfg. Co., Clinton, Mo.
Mich. Bolt & Nut Wks., Detroit.
Minerallac Electric Co., Chicago, Ill.
North Penn Iron Co., Phila., Pa.
Norton, W. T., West Park, O. ("Cleveland" Cable Hangers, "Little Giant" Messenger Hangers).
Oliver Iron & Steel Co., Pittsburgh.
Rhode Island Telephone & Elec. Co., Providence, R. I., "Wright."
Star Expansion Bolt Co., New York.

HANGERS, Conduit

Pipe Hangers.
Beam Clamps.
Pipe Straps.
Cleats.

APPLETON ELEC. CO., 212 N. Jefferson st., Chicago, Ill.
COLUMBIA METAL BOX CO., 226 E. 144th st., New York, N. Y.
FRALICK & CO., S. R., 15 E. Clinton st., Chicago, Ill., "Kwikon."
LANZ & SONS, M., Pittsburgh, Pa.
LOVELL & CO., F. H., Arlington, N. J.
PASS & SEYMOUR, Solvay, N. Y.
STAR METAL BOX CO., 173 Hudson st., New York, N. Y.
STEEL CITY ELECTRIC CO., 1207 Columbus ave., Pittsburgh, Pa. ("Fullman" Beam Straps).
THOMAS & BETTS CO., 103 Hudson st., New York, N. Y.
WALL MFG. & SUPPLY CO., P., 705 Preble ave., Pittsburgh, Pa.

Collins Mfg. Co., Pittsburgh, Pa.
Fee & Mason, New York, "A. B. C." and "F. M.," "Astoria."
Grabler Mfg. Co., Cleveland, O. ..
Illinois Malleable Iron Co., Chicago.
Irish Electric Co., W. F., New York. "Shamrock."
Kales-Haskel Co., Detroit, Mich.
Line Material Co., So. Milwaukee Wis.
Minerallac Electric Co., Chicago, Ill.
North Western Stamping Co., Burlington, Ia.
Pittsburg Valve & Fittings Co., Barberton, O. (Cleats).
Wolf Mfg. Co., L., Chicago, Ill. (Cleats).

HANGERS, Fixture & Box.

Hangers—Supporters.

AUSTIN & CO., M. B., 700 Jackson blvd., Chicago, Ill.
CUTTER CO., GEO., 411 Notre Dame, South Bend, Ind.
FEDERAL SIGN SYSTEM (ELEC.), Lake & Desplaines sts., Chicago, Ill.

Empire Engineering & Supply Co., New York, "Knight."
Fee & Mason, New York, N. Y.
Harter Mfg. Co., Chicago, Ill.
Harvard Elec. Co., Chicago, Ill.
Inland Elec. Co., Chicago, Ill.
Knauber & Co., Alex. M., Chicago.
Metal Specialties Co., Kansas City, Mo., "McKinley."

HANGERS, Lamp

Tungsten & Nitrogen Lamp Cutout Hangers.

BRYANT ELEC. CO., Bridgeport, Ct.

Thompson Elec. Co., Cleveland, O.

HAT CLEANERS.
See Cleaners, Hat.
HAT IRONS.—See Irons, Hat.
HEADLIGHT DIMMERS.
See Dimmers, Headlight.
HEADLIGHTS, AUTOMOBILE.
See Lamps, Automobile.

HEADLIGHTS, Car.

CROUSE-HINDS CO., Syracuse, N. Y.
GENERAL ELECTRIC CO., Schenectady, N. Y. (Magnetite).

Dayton Mfg. Co., Dayton, O., "Eureka," "Mosher," "Rex," "Venus," "Wagenhals," "Wellman."
Dressel Ry. Lamp Wks., New York.
Esterline Co., Indianapolis, Ind., "Golden Glow."
Glazier Headlight Co., Rochester.
Ham Mfg. Co., Rochester, N. Y.
Neal Electric Headlight Co., Boston.
Rochester (N. Y.) Headlight Works.
Schroeder Headlight Co., Evansville, Ind. (Turbo-generator Sets).
Smith of New York Co., New York.
Southern Railway Supply Co., St. Louis, Mo., "Anderson-Smith."
Star Headlight Co., Rochester, N. Y.
Sun Lamp Works, Chicago, Ill.
Trolley Supply Co., Canton, O., "Climax," "Star," "Globe."
U. S. Headlight Co., Buffalo, N. Y.
Wheeler Reflector Co., Boston, Mass.

HEARING DEVICES,

(Aid to hearing.)

Boston Talking Machine Co., Boston, Mass., "Detectophone."
Clear Phone Co., Stamford, Conn.
Detecta Phone Co. of Am., New York, N. Y., "Burns."
General Acoustic Co., New York, "Acousticon."
Globe Ear-Phone Co., Boston, Mass.
Harper Oriphone Co., Boston, Mass.
Mears Ear Phone Co., New York, "Aurophone," "Aurasage."
Stolz Electrophone Co., Chicago, Ill., "Audiphone," "Electrophone," "Operaphone."
Stromberg-Carlson Tele. Mfg. Co., Rochester, "Deffone," "Hear-A-Phone," "Telodective."
Williams Articulator Co., Chicago, Ill.

HEATERS, Car (Electric).

Consolidated Car Htg. Co., New York.
Gold Car Htg. & Ltg. Co., New York.
Johns-Manville Co., H. W., N. Y.
Railway Utility Co., Chicago, Ill.
Royal Elec. Heater Co., Chicago, Ill.
Smith Heater Co., Detroit, Mich.

HEATERS, ELECTRIC.
See Specific Article.

HEATERS, Liquid, Electric.

Water Heaters (Circulating).
Water Heaters (Immersion Coil).
Water Heaters (Radiator Type).
Water Bottle Heaters.
Bath Heaters.
Hot Drink Heaters
Instantaneous Heaters.
Flask Heaters
Shaving Mugs
Medicine Warmers
Dental and Surgical Sterilizers
Milk Warmers.
Steam Boiler Heaters.

AMERICAN ELECTRICAL HEATER CO., Detroit, Mich.
Water Heaters (Immersion Coil).
CUTLER-HAMMER MFG. CO., Milwaukee, Wis.
Instantaneous Portable Water Heaters.
Shaving Mugs.
GENERAL ELECTRIC CO., Schenectady, N. Y.
Hot Water Cup.
Water Heaters (Circulating).
INTERNATIONAL ELEC. CO., Century Bldg., Indianapolis, Ind.
LINCOLN ELEC. HTG. APPLIANCES, INC., 112 W. Adams st., Chicago, Ill.
NATIONAL ELEC. CO., 149 W. Austin ave., Chicago, Ill.
"Hold Heet" Immersion Heater.
WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa.
Water Heaters (Immersion Coil).
Bath Heaters.
Milk Warmers.
WHITE MFG. CO., J. H., 111 N. Third st., Brooklyn, N. Y.
"Langerfield" Milk Warmer.

Acme Elec. Heater Co., Detroit.
"Handy Andy" Water Heaters (Immersion Coil).
Butte Engineering & Elec. Co., San Francisco, Cal.
Superheaters.
Copeman Elec. Stove Co., Flint, Mich.
Cutler El. Heater Co., San Francisco.
Detroit Electric Heater Co., Detroit.
"Calor" Water Heaters.
Diamond Electric Water Heater Co., San Francisco, Cal.
Water Heaters (Immersion Coil).
Electric Heat Storage Co., New York.
"Therol" Water Heaters.
Electric Mfg. Co., San Francisco.
"Emco" Water Heater.
Geyser El. Water Heater Co., N. Y.
Instantaneous.
Hot Point Elec. Htg. Co., Ontario, Cal., "ElBollo" Heater.
Hughes & Co., D. C., Chicago, Ill., "Elektro" Heater.
Janette Mfg. Co., Chicago, Ill.
Jupiter Elec. Products Co., Cleveland, O.
Liquid Heaters.
Konsrv Elec. Co., Cleveland, O., "Servu."
Landers, Frary & Clark, New Britain, Conn.
"Universal" Water Heaters (Immersion Coil).
Universal Shaving Mug.
Loetscher-Ryan Mfg. Co., Dubuque, Ia.
Mabey's Elec. & Mfg. Co., Indianapolis, Ind.
Water Bottle Heaters.
Monarch Elec'l Mfg. Co., Willoughby, O.
Water Heaters (Immersion Coil).
Nat'l St'p'g & El. Wks., Chicago.
"Superior" Water Heaters.
Pelouze Mfg. Co., Chicago, Ill.
Water Heaters (Circulating).
Pelton & Crane Co., Detroit, Mich.
Water and Liquid Heaters.
Dentists' Sterilizers.
Pick & Co., Albert, Chicago, Ill.
"Pix" Water Heaters.
Presto Elec. Co., San Francisco, Cal.
Water Heaters (Immersion Coil).
Dentists' Sterilizers.
Prometheus Elec. Co., New York.
Liquid Heaters.
Quick Elec. Heater Co., Cincinnati, O.
Dental Sterilizers.
Radio Elec. Co., New York, N. Y.
Ransom & Randolph Co., Toledo, O.
"Ideal" Dental Sterilizers and Spraying Outfits.
Rathbone Mfg. Co., Grand Rapids, Mich., Water Heaters (Radiator Type).
Reliance El. Htg. Co., Columbia, Pa.
Flask Heaters.
Rochester Stamping Co., Rochester.
Liquid Heaters.
Sales Co., Inc., San Francisco, Cal.
"Sterling" Water Heater.
Schoenberg Elec. Co., San Francisco.
Water Heaters (Immersion Coil).
Dentists' Sterilizers.
Medicine Warmers.
Seifke & Co., H. A., San Francisco, Cal., "Marvelous."
Simplex Elec. Heating Co., Cambridge, Mass.
Milk Warmers.
Steam Boiler Heaters.
Water Heaters (Circulating).

HEATING DEVICES,

(Industrial Purposes.)

AMERICAN ELEC'L HEATER CO., Detroit, Mich. (Laboratory Plates).
INTERNATIONAL ELEC. CO., Century Bldg., Indianapolis, Ind.

Edwards Mfg. Co., Cincinnati, O. (Garment Pressers).
Fearn Company, Baltimore, Md. ("Calorel" Shoe Treeing Irons).
Freeman Co., Louis G., Cincinnati, O. (Boot and Shoe Appliances).
Mabey's Elec. & Mfg. Co., Indianapolis, Ind. (Patching Tools).
Peerless Elec. Htg. Co., Boston, Mass. (For Shoe Factories).
Reimers Mfg. Co., New York (Die Heaters—Rolls—Embossers—Branding Irons).
S. W. Electric Co., New York.
Schwimmer Co., H. W., Indianapolis.
Vulcan Elec. Htg. Co., Buffalo, N. Y. Branding Irons.

HEATING SYSTEMS, Underground.

American District Steam Co., North Tonawanda, N. Y., "Holly."

HICKIES. See Studs.
HIGH TENSION FITTINGS.
See Fittings, High Tension.

HOLDERS, Battery.

EUREKA SUPPLY CO., Sewell, N. J. (Fibre).
STANLEY & PATTERSON, 23 Murray st., New York, "Patterson."

Campbell Co., A. S., Boston, "Cello."
Michigan Motor Specialties Co., Detroit, Mich., "Becco."
National Carbon Co., Cleveland, O.
Niagara Mfg. Co., Holyoke, Mass.
Mersman Bros., Ottawa, O., (Cabinet).
Paragon Elec. Co., Chicago, Ill.
Stevens, H. A., Boston, "Economy."
Thomas Mfg. Co., C. A., Auburn, N. Y., "Hot Spark."

HOLDERS, BOX.
See Hangers, Fixture & Box.

HOLDERS, Brush.

Baylis Co., Bloomfield, N. J.
Par-Sil Metal Co., Lansdale, Pa.

HOLDERS, Cord.

(For Sad Irons.)

Paragon Elec. Co., Chicago, Ill.

HOLDERS, LAMP, MAGNETIC.
See Sockets, Magnetic Holding.
HOLDERS, NITROGEN.
See Shells, Chandelier.

HOLDERS, Sad Iron.

Central Station Mfg. Co., Binghamton, N. Y.
Millar Elec. Wks., R. M., Chicago, Ill., "Utility."

HOLDERS, Shade.

BRYANT ELEC. CO., Bridgeport, Conn., "Uno."
CROUSE-HINDS CO., Syracuse, N. Y.
FARIES MFG. CO., 1036 E. Grand ave., Decatur, Ill.
HERWIG ART SHADE & LAMP CO., 2140 N. Halsted st., Chicago, Ill., "Ventilite."
HUBBELL, INC., HARVEY, Bridgeport, Conn.
J-E-M SHADE HOLDER CO., 221 W. 33rd st., New York, N. Y.
NATIONAL X-RAY REFLECTOR CO., 233 Jackson blvd., Chicago.
PEERLESS LIGHT CO., Peerless Bldg., Chicago, Ill., "Snap On."
PLUME & ATWOOD MFG. CO., Waterbury, Conn., "Victor," "Plumwood" ("Simplex" Inverted).
TREGONING ELECTRIC MFG. CO., 416 W. Prospect st., Cleveland, O. (For Tungsten Lamps).
WHITE MFG CO., J. H., 111 N. Third st., Brooklyn, N. Y.

Art Metal Mfg. Co., Cleveland, O., "A.-M."
Brandt-Dent Co., Watertown, Wis.
Cruikshank, John, Shamokin, Pa., "Shatter-Lock."
Fixture Specialty Co., Los Angeles.
Grady Fixture Mfg. Co., M. J., Minneapolis, Minn. (Inverted).
Gudeman & Co., New York.
Manhattan Brass Co., New York, "Perfection."
Pittsburgh (Pa.) Reflector & Illuminating Co. (Adjustable).
Solar Elec. Co., Chicago, Ill.
Steele & Johnson Mfg. Co., Waterbury, Conn.
Waldo Co., New York, "Two In One."
Waterbury Mfg. Co., Waterbury, Ct., "Acme."

HOODS, ST. FIXTURE.
See Fixtures, Street.
HOOKS, CHANDELIER.
See Fittings, Fixture, Brass.
HOOKS, INSULATING.
See Rings & Hooks.
HORN FIBRE—See Fibre.
HORN GAP SWITCHES.
See Switches, Disconnecting.

HORNS, ELECTRIC.

Automobile and Factory.

AMERICAN EVER READY WKS. OF NAT'L CARBON CO., Long Island City, N. Y.
BENJAMIN ELEC. MFG. CO., 129 S. Sangamon st., Chicago, Ill., "Dean," "Fordorn."
FITZGERALD MFG. CO., Torrington, Conn., "Clero."
HOLTZER-CABOT ELEC. CO., Boston, Mass., "Autobis," "Reacto."
MANHATTAN ELEC. SUPPLY CO., 17 Park pl., New York, "Mesco."
SCHWARZE ELEC. CO., Adrian, Mich.

Adams-Bagnall Elec. Co., Cleveland, O., "A. B. Trumpet."
Alexander Mfg. Co., C. J., New York, N. Y., "Jasco."
Am. Elec. Co., Chicago, "Samson."
Automobile Supply Mfg. Co., B'klyn, N. Y., "Newtone," "Ruben," "Electra," "Apollo."
Duplex Elec. Mfg. Co., Pittsburgh, Pa., "Safeguard."
Electric Horn & Specialty Co., Utica, N. Y., "Oneida."
Elec. Spark Appliance Co., Brooklyn, N. Y., "Olympic."
Fulton-McCutchan Co., Chicago, Ill.
Garford Mfg. Co., Elyria, O., "Tuto," "Rexo," "Maxo."
Hipwell Mfg. Co., Pittsburgh, Pa.
Johns-Manville Co., H. W., New York. "Long."
Kales-Haskel Co., Detroit, Mich., "Ka-Ha-Co."
Lovell-McConnell Mfg. Co., Newark, N. J., "Klaxon."

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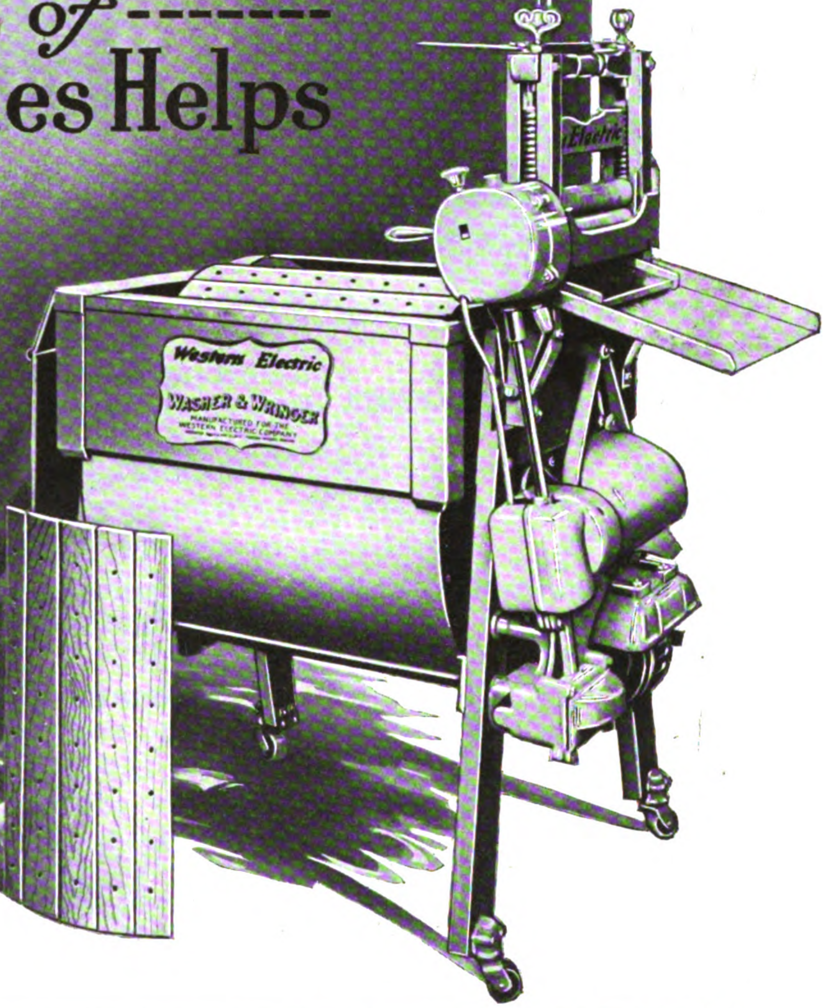
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Maxeff Elec. Horn Co., Detroit, Mich.
Nonpareil Horn Mfg. Co., N. Y.
O'Brien Electrophone Co., Hallowell, Me., "Mogul," "Elektron."
Premier Elec. Co., Chicago, Ill., "Repello," "Hi-Lo."
Randall-Faichney Co., Boston, Mass., "Jubilee," "Jericho."
Russell Elec. Co., Danbury, Ct., "Saxon," "Rapid Fire," "Russell-Hammer," "A. C.," "Treco," "A. C.," "Rapid Fire" (Whistle).
Sireno Co., New York, N. Y.
Sparks-Withington Co., Jackson, Mich., "Sparton."
Superior Lamp Mfg. Co., New York.
Trinity Bell Elec. Mfg. Co., Chicago, Ill. ("Trinity" Bell).

HORSE CLIPPERS. See Clippers.
HOSPITAL SIGNALS.
See Signals, Hospital.
HOT DRINK HEATERS.
See Heaters, Liquid.
HOT WIRE INSTRUMENTS.
See Instruments, Testing.
HOUSE NUMBERS.
See Numbers, House.
HOUSES, POLE OR PILOT.
See Platforms, Poles.

HUMIDIFIERS.

DUNTLEY PRODUCTS SALES CO., 732 Michigan ave., Chicago, Ill.
Briggs, Shaffner & Co., Winston-Salem, N. C., "Clean-Air," "Hygrosse."
Carrier Air Conditioning Co., N. Y.
Cramer, S. W., Charlotte N. C. (Air Purifying Apparatus).
Kauffman Heating & Engineering Co., St. Louis, Mo., "Kinealy."
McCreery Engng. Co., Detroit, Mich.
Thomas & Smith, Chicago, Ill. (Air Purifying Apparatus).
Webster & Co., W., Camden, N. J.

HUSKS. See Shells, Chandelier.

HYDROMETERS AND SYRINGES.

Edelmann & Co., Chicago, Ill.
General Scientific Equipment Co., Philadelphia, Pa.
Marcuson, E., New York, N. Y., "Witham."
Storage Battery Supply Co., New York, N. Y., "Reliance."
Tagliabue Mfg. Co., C. J., Brooklyn.
Taylor Inst. Co.'s, Rochester, N. Y.
Turner Brass Works, Sycamore, Ill.
Vuille, Charles A., Huntingdon, Pa.

ICE CREAM FREEZERS.
See Freezers, Ice Cream.
ICE MACHINES. See Refrigerators.

IGNITION OUTFITS.

Magnetos.
Spark Coils.
Timers.

AMERICAN ELEC'L WKS., Phillipsdale, R. I., "Endure" Spark Coil.
CARLISLE & FINCH CO., 221 E. Clifton ave., Cincinnati, O.
CONNECTICUT TELEPHONE & ELECTRIC CO., Meriden, Conn.
KENDRICK & DAVIS CO., Lebanon, N. H.
HOLTZER-CABOT ELECTRIC CO., Boston, Mass.
JEFFERSON ELEC. MFG. CO., 849 Harrison st., Chicago, Ill.
MENOMINEE ELEC. MFG. CO., Menominee, Mich.
WESTERN ELEC. CO., New York., "Western Elec. Pittsfield."
American Coil Co., Foxboro, Mass.
Astoria Coil Co., L. I. City.
Auto Coil Co., Jersey City, N. J., "Owners," "Jumphlame," "Varley."
Bosch Magneto Co., New York.
Dayton-Dick Co., Quincy, Ill., "Da-Lite."
Dayton (O.) Elec'l Mfg. Co., "Apple."
Detroit Coil Co., Detroit, Mich.
Dow Mfg. Co., Braintree, Mass., "Komet."
Eisemann Magneto Co., New York.
Elec'l Specialties Mfg. Co., Omaha, Neb., "Blitz."
Elkhart Mfg. Co., Monroe, Mich.
Heinze Elec. Co., Lowell, Mass.
Hendricks Magneto & Elec. Co., Indianapolis, "Eureka," "Comet."
Hercules Elec. Co., Indianapolis, Ind.
Herz & Co., New York.
Hoosier Coil Co., So. Bend, Ind.
Igniter Appliance Co., Cleveland, O.
J. & B. Mfg. Co., Pittsfield, Mass.
K. W. Ignition Co., Cleveland, O.
Kent Mfg. Wks., Atwater, Philadelphia, Pa.
Knobloch-Heideman Mfg. Co., South Bend, Ind., "Quick Action."
Kokomo Elec. Co., Kokomo, Ind., "Kingston."
Lemke El. Co., Milwaukee, "L-B."
Marburg Bros., New York, "Mea."
Marine Launch Igniting Co., Watkins, N. Y., "A. B. C."
Mavity Sleeper Co., Fowler, Ind.
Motsinger Device Mfg. Co., La Fayette, Ind., "Auto-Sparker."
National Coil Co., Lansing, Mich., "Capitol."
New Era Spring & Specialty Co., Detroit, Mich.
N. Y. Coil Co., N. Y., "Economic," "Fire Ball," "Rhoades."
Noxon, C. Per Lee, Syracuse, N. Y.
Pfanstiehl Co., North Chicago, Ill.
Remy Electric Co., Anderson, Ind.
Reppell Elec. Co., Kansas City, Mo.
Samson Elec. Co., Canton, Mass., "Perfex."
Sevison Electric Co., Elkhart, Ind.
Schug Electric Mfg. Co., Detroit.
Simms Magneto Co., East Orange, N. J.
Splitdorf Elec. Co., Newark, N. J.
Standard Motor Const. Co., Jersey City, N. J.
Sumter (S. C.) Elec'l Co.
Swiss Magneto Co., Chicago, Ill.
Tritt Electric Co., Union City, Ind., "Peerless," "Vim."
Vesta Accumulator Co., Chicago.
Webster Elec. Co., Racine, Wis.
Wells Mfg. Co., Fond du Lac, Wis.
Williams, E. Q., Syracuse, N. Y.
Witherbee Igniter Co., Springfield, Mass., "Volta."

ILLUMINATED COLUMNS.
See Columns, Illuminated.
IMMERSION COILS.
See Heaters, Liquid.
IMPREGNATING COMPOUNDS.
See Paints & Compounds.
IMPREGNATING MACHINES—
See Driers & Impregnators.

IMPREGNATING,VACUUM

See Pages 200-201

INCUBATORS.
See Farm Equipment.
INCUBATORS, LABORATORY.
See Ovens, Drying, Elec.

INDICATORS, Operation

For Manager's Office.
Slocum, Avram & Slocum, New York, "Productograph."
Electric Weighing Co., New York.

INDIRECT LTG. FIXTURES.
See Fixtures, Ltg.
INDUCTION COILS.—See Coils.

INGREDIENTS.

For Moulded Insulation
CONDENSITE CO. OF AMERICA, Bloomfield, N. J.
GENERAL BAKELITE CO., 100 William st., New York.

INSTANTANEOUS WATER HEATERS—See Heaters, Liquid.
INSTRUMENTS, CURVE DRAWING.—See Instruments, Recording.

INSTRUMENTS, Indicating.

Portable and Switchboard:
Ammeters.
Differential Voltmeters.
Duplex Meters.
Electrostatic Voltmeter.
Frequency Meters.
Ground Detectors.
Laboratory Instruments.
Milli-Ammeters.
Milli-Voltmeters.
Phase Rotation Ind.
Polarity Indicators.
Portable Galvanometers.
Potential Indicators.
Power Factor Meters.
Shunt Ammeters.
Sychroscopes.
Voltmeters.
Volt-Ammeters.
Wattmeters.

AMERICAN EVER READY WKS. OF NAT'L CARBON CO., Long Island City, N. Y.
BIDDLE, JAMES G., 1211 Arch st., Philadelphia, Pa.
"Fram" Frequency Meters (Imp.), "Siemens - Halske" Instruments (Imp.).
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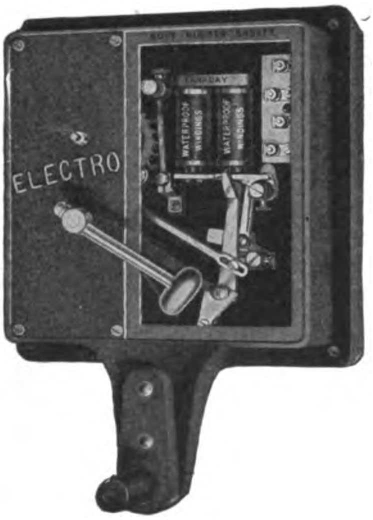
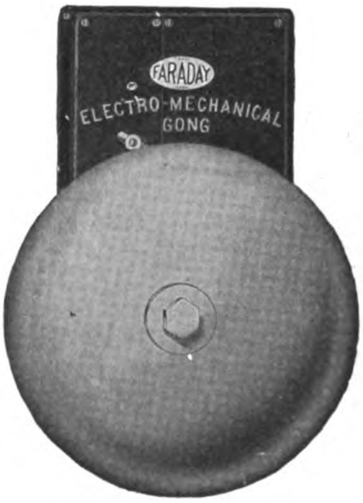


Mechanism of Faraday Fire Alarm Gong Electro-Mechanical Type



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IRONS, Hat.

CUTLER-HAMMER MFG. CO., Milwaukee, Wis.
WESTINGHOUSE ELECTRIC & MFG. CO., Pittsburgh, Pa.
S. W. Elec. Co., New York.
Simplex Elec. Heating Co., Cambridgeport, Mass.

IRONS. Sad.

Flat Irons.
Sad Irons.
Drag Irons.
Tailors' Goose.
Laundry Equipment.
AMERICAN ELECTRICAL HEATER CO., Detroit, Mich.
"American Beauty," "Little Beauty" and "Triangle" Irons.
CUTLER-HAMMER MFG. CO., Milwaukee, Wis.
Sad Irons.
GENERAL ELECTRIC CO., Schenectady, N. Y.
Sad Irons.
GLOBE STOVE & RANGE CO., Kokomo, Ind.
LINCOLN ELEC. HTG. APPLIANCES, INC., 112 W. Adams st., Chicago, Ill., "Home Maid."
LINDSTROM-SMITH CO., 1100 S. Wabash ave., Chicago, Ill.
MANHATTAN ELECTRICAL SUPPLY CO., 17 Park pl., New York, "Mesco" Sad Irons.
MENOMINEE ELEC. MFG. CO., Menominee, Mich.
PHELPS MFG. CO., 265 Jefferson ave., Detroit, Mich.
"So Easy" and "Venus" Flat Irons. "Handy" Travelers Iron.

70 MORE LIKE THESE

There is Profit for the dealer and Satisfaction for the customer in these and the 70 more big and little brothers of the EVEREADY Flashlight line.

EVEREADY Flashlights
Money-makers because—

First: The big EVEREADY Advertising Campaign in the Saturday Evening Post and 57 other magazines—Women's, Boys', Sportsmen's, Farmers', Doctors' and Nurses' Journals—is creating a steadily increasing demand for EVEREADY Flashlights.

Second: Made by the "Largest Manufacturers of Flashlights in the World"—EVEREADY Flashlights, Batteries and Lamps are absolutely reliable, and give such perfect satisfaction that the customer will keep coming back to the ***same*** store to buy the EVEREADY Batteries and Lamps to keep the EVEREADY Flashlight in service—3 or 4 batteries and 2 or 3 lamps a year.

Third: EVEREADY Flashlights, like blades for Safety Razors; Films for Cameras; Records for Phonographs, keep the customers ***coming back***—then they buy other things, too. Isn't this the kind of business you want? The kind that sells itself and repeats and repeats?

Remember it's EVEREADY reliability that counts in the long run.

Let us tell you how to make money with the EVEREADY line. Just mail the coupon.

AMERICAN EVER READY WORKS
Long Island City of National Carbon Company **New York**

Branches: Atlanta, San Francisco, Chicago
Canadian Factory: Canadian Ever Ready Works of Canadian National Carbon Company, Limited, Toronto, Ontario, Canada

36

Kindly send your Special Proposition and Catalogue No. 40, giving prices and complete list of goods.

Name ....

Street Address............

....

City ....

State ....

Jobber ....
AMERICAN EVER READY WORKS
of National Carbon Company
Long Island City - - New York

WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa.
Laundry Irons.
Tailors' Irons.
Sad Irons.
Drag Irons.
WICKS ELEC. CO., 1384 E. 40th st., N. E., Cleveland, O.
Sad Irons.

Acme Elec. Heater Co., Detroit.
"Standard Sex" and "Autocratic" Sad Irons.
Apex Elec. Htg. Co., Cincinnati, O.
Sad Irons.
Chicago Flexible Shaft Co., Chicago, Ill., "Princess" Sad Irons.
Cummins & Co., James H., Chicago, "Fansteel" Sad Irons.
Current Elec. Co., Chicago, Ill.
"Three-Heat" Sad Irons.
Detroit (Mich.) Elec. Heater Co., "Happy" Sad Irons.
Dover Mfg. Co., Canal Dover, O.
"A-Best-O," "Domanco," "Favorite" Sad Irons.
Electric Mfg. Co., San Francisco.
"Mrs. Potts" Sad Irons.
Elec. Specialties Co., Lansing, Mich., "Sta-Hot" Sad Irons.
Hot Point El. Htg. Co., Ontario, Cal.
Sad Irons—Jumbo Irons—Laundry Irons— Tailors' Goose.
Landers, Frary & Clark, New Britain, Conn.
"Universal," "Thermax" Sad Irons.
Loetscher-Ryan Mfg. Co., Dubuque, Iowa, "Ideal Heat" Sad Irons.
Michigan Stove Co., Detroit, Mich., "Garland" Sad Irons.
Ober Mfg. Co., Chagrin Falls, Ohio.
Sad Irons.
Pelouze Mfg. Co., Chicago, Ill.
Sad Irons—Tailors' Goose—Tailors' Irons—Traveling Irons.
Pfanstiehl Co., North Chicago, Ill.
Pittsburgh (Pa.) Elec. Specialty Co.
"Helion" Sad Iron.
Prometheus Elec. Co., New York.
Sad Irons.
Reimers Mfg. Co., New York.
Sad Irons.
Reliance Elec. Htg. Co., Columbus, Pa.
"Climax" Flat Iron.
Reliance El. Htg. Co., Passaic, N. J.
Sad Irons—Tailors' Irons.
Rochester Stamping Co., Rochester.
Sad Irons.
Rutenber Elec. Co., Logansport, Ind.
Sad Irons.
Simplex El. Htg. Co., Cambridgeport, Mass.
Laundry Equipment—Tailors' Goose —Sad Irons—Drag Irons.
Sterling Machine & Stamping Co., Wellington, O.
"Diamond" Sad Irons.
Sun Utilities Co., Moline, Ill.
"Joyful" Sad Irons.
S. W. Elec. Co., New York.
Sad Irons.
Victor Iron Co., Logansport, Ind.
Sad Irons.
Vulcan Elec. Heating Co., Buffalo.
Sad Irons.
Waage Electric Co., Chicago, Ill.
"Triple Heat" Flat Irons.

IRONS, Soldering, Electric.

GENERAL ELECTRIC CO., Schenectady, N. Y.
MANHATTAN ELECTRICAL SUPPLY CO., 17 Park pl., New York, N. Y., "Mesco."
NATIONAL ELEC. CO., 149 W. Austin ave., Chicago, Ill., "Hold-Heet."
Apex El. Co., Chicago, "N. D. Co."
Cook, F. B., Chicago, Ill.
Hoskins Mfg. Co., Detroit, Mich.
Presto Elec. Co., San Francisco.
S. W. Elec. Co., New York.
Simplex Elec. Heating Co., Cambridgeport, Mass.
Union Electric Products Co., Detroit.
Vulcan Elec. Heating Co., Buffalo.
Waage Electric Co., Chicago, Ill.

JACK BOXES.—See Telephones.

JACK STRAPS.—See Bags, Belts.

JACKS, ARMATURE.
See Machines, Armature.

JARS, Glass (Battery).

For Composition Jars see Moulded Insulation, also Rubber.
BROOKFIELD GLASS CO., 2 Rector st., New York, N. Y.
Cumberland Glass Mfg. Co., Bridgeton, N. J.
Gaynor Glass Works, Salem, N. J.
Gillinger & Sons, Philadelphia, Pa.
Illinois Glass Co., Chicago, Ill.
Whitall, Tatum & Co., Phila., Pa.

JEWELS, Instrument, Bearings.

American Jewel Co., Boston, Mass.
Am. Oil & Supply Co., Newark, N. J.
Bird, Richard H., Waltham, Mass.
Diamond Cupped Bearing Co., N. Y.
Fisher & Vinal Jewel Co., Waltham, Mass.
Oppenheimer & Co., H. E., N. Y.
Wennstrom, John, Suffern, N. Y.
Worley, John, Waltham, Mass.

JOBBERS.—See Supplies.

JOINTS, Cable.

MATTHEWS & BRO., W. N., 3705 Forest Park blvd., St. Louis, Mo.
Dossert & Co., New York.

JOINTS, Fixture Insulating.

MACALLEN CO., Macallen & Foundry sts., Boston, Mass.
THOMAS & BETTS CO., 103 Hudson st., New York, N. Y., "T. & B."
TRUMBULL ELECTRIC & MFG. CO., Plainville, Conn., "Jaynes."
WIRT CO., Germantown, Philadelphia, Pa., "Di-El-Ite."
YOST ELEC. MFG. CO., Toledo, O.
Vossberg, Gustav, Toledo, O.

JUNCTION BOXES.
See Boxes, Conduit.

KETTLES, COOKING.
See Cooking Utensils.

KETTLES, PITCH.—See Pots.

KEY CUTTERS.—See Cutters, Key.

KEYS, Socket, Detachable.

Jackson Mfg. Co., Memphis, Tenn., "Jo-Jo."

KICKPLATES.
See Blocks, Moulding.

KITCHEN RANGES.
See Boilers, Electric.

KITS, Tools.

Kennedy Mfg. Co., Chicago, Ill.
Klein & Sons, Mathias, Chicago.

KNIFE SWITCHES.
See Switchboards, Lt. & Pr.

KNOBS—See Porcelain.

LABORATORY OVENS.
See Ovens, Drying.

LACQUER, LAMP.
See Coloring, Inc. Lamp.

LACQUER, Metal.

FRANCHE & CO., C. E., 440 Orleans st., Chicago, Ill.
GENERAL BAKELITE CO., 100 William st., New York.
American Lacquer Co., Bridgeport, Conn., "Diamond."
Arnold, N. B., Brooklyn, N. Y., "Slikup."
Ault & Wiborg, Cincinnati, O.
Barrett & Co., M. L., Chicago, Ill.
Celluloid Zapon Co., New York.
Chemical Products Co., Boston, Mass., "Celestron."
Cooper & Co., Chas., New York.
Day & Co., James B., Chicago, Ill.
Diamond Lacquer Co., New York.
Egyptian Lacquer Mfg. Co., N. Y.
Essex Varnish Co., New York.
Glidden Varnish Co., Cleveland, O.
Hanson & Van Winkle Co., Newark, N. J.
International Smokeless Powder & Chemical Co., Wilmington, Del.
Maas & Waldstein Co., Newark, N. J.
Moller & Schumann Co., Brooklyn.
Nikolas & Co., G. J., Chicago, Ill.
O'Brien Varnish Co., So. Bend, Ind.
Opal Chemical Co., Kenilworth, N. J.
Oriental Varnish Wks., Brooklyn.
Pacific Elec. Co., La Crosse, Wis., "Playtone."
Schlegel Mfg. Co., Oscar, New York, N. Y., "Osmace."
Zinsser & Co., W., New York.

LAG BOLTS—See Bolts, Lag.

LAMP CHESTS, AUTO.
See Chests, Automobile Lamp.

LAMP CLAMPS.
See Clamps, Lamp Attaching.

LAMP GRIPS—See Grips, Lamp.

LAMP GUARDS.
See Guards, Inc. Lamp.

LAMP LOCKS—See Locks, Lamp.

LAMPS, Arc.

Flaming. Miniature.
Enclosed. Intensified
GENERAL ELECTRIC CO., Schenectady, N. Y. ("Magnetite," "Luminous" Enclosed Intensified).
WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa.
Am. Arc Lamp Co., Kalamazoo, Mich. "Lea," "Northall" (Enclosed).
Aurora Electric Co., Aurora, Ind. (Miniature).
Austrich Arc Lamp Co., New York (Miniature).
Bell Arc Light Co., New York, N. Y. (Flaming).
Dyer Flaming Arc Co., Philadelphia.
Eclipse Electric Arc Light Co., New York, N. Y. ("Intensified").
General Illuminating Co., New York, N. Y. ("Grant" Intensified).
Hirschberg Co., H. M., New York (Import "Siemens" Flaming).
Hughes Universal Arc Lamp Co., Phila., Pa. (Universal Non-Magnet).
Kandem Elec. Co., New York ("Excello" Flaming).
New York Engravers' Supply, New York, N. Y. ("Whitelite").
Philadelphia Electric & Mfg. Co., Phila. ("Pemco" Tungsten Arc).
Radio Electric Co., New York, N. Y. ("Alexander" Intensified).
Scott Elec. Co., Newark, N. J. (Flaming).
Sorenson, P., Brooklyn, N. Y., "Brightlight," Enclosed.
Stave Elec. Co., New York, N. Y. ("Stavelco" Intensified, Flaming).
Toerring Co., C. J., Philadelphia, Pa. (Enclosed and Flaming).
Warner Lamp Co., Davenport, Ia.
Warren Elec. Co., New York, N. Y., "Duplex."
Wohl & Co., M. J., Brooklyn, N. Y. ("Economy" Enclosed).

LAMPS, Automobile.

Meaning the complete Lamp.
Automobile. Electric Side.
Motorcycles. Head, Tail.
Motor Boats. Bicycle.
CENTRAL TELE. & ELEC. CO., 310 N. 11th st., St. Louis, Mo. ("Pract-El-Lite" Bicycle Lamp).
IMPORT SALES CO., 19 East 21st st., New York, N. Y.
METAL SPECIALTIES MFG. CO., 748 W. Monroe st., Chicago, Ill. ("Presto" Bicycle Lamp).
ROSEN & CO., A. W., 610 Broadway, New York.
A. B. Mfg. Co., Poughkeepsie, N. Y.
Adams-Bagnall Elec. Co., Cleveland, O., "Ab Auto Lite."
Adams & Westlake Co., Chicago, Ill., "Adlake."
Aiken Co., Herrick, Lawrence, Mass.
Badger Brass Co., Kenosha, Wis., "Solar," "De Lux," "Alpha."
Bosch Magneto Co., New York.
Campbell Co., A. S., Boston, "Cello."
Castle Lamp Co., Amesbury, Mass.
Chicago Auto Lamp Works, Chicago
Columbus (Ohio) Auto Brass Co.
Corcoran Lamp Co., Cincinnati, O.
Cowles & Co., C., New Haven, Conn.
Dietz Co., R. E., New York, N. Y.
Edmunds & Jones Mfg. Co., Detroit.
English & Mersick Co., New Haven, Conn.
Esterline Co., Indianapolis, Ind., "Golden Glow."
Fowler Lamp & Mfg. Co., Chicago.
Gray & Davis, Cambrdge, Mass.
Guide Motor Lamp Co., Cleveland, O.
Hall Lamp Co., C. M., Detroit, Mich.
Holt & Beeber Co., Boston, Mass.
Indiana Lamp Co., Connorsville, Ind.
Johns-Manville Co., H. W., New York, "J. M. Mobilite."
MacDonald, Donald N., Boston.
Milwaukee Bronze Casting Co., Milwaukee, Wis., "Electric Star."
New Lite Mfg. Co., Newton, Ia.
O'Brien Co., Joseph F., New York.
Pagin Lamp Co., J. R., Chicago.
Perfecto Light Co., Des Moines, Ia.
Premier Elec. Co., Chicago, Ill. ("Taylor's" Tail Light).
Reynolds-Brown Co., Chicago, Ill., "Arbeco."
Rose Mfg. Co., Phila., "Neverout."
Saratoga Pilot Lamp Co., Saratoga Springs, N. Y.
Scoville & Peck Co., New Haven, Ct.
Silvey Electric Co., Dayton, O.
Storage Battery Supply Co., New York, N. Y. (Cluster for Interior).
Superior Lamp Mfg. Co., New York.
Vesta Accumulator Co., Chicago, Ill.
Victor Lamp Co., Cincinnati, O.
White Diamond Co., Indianapolis.
White Mfg. Co., Brdgeport, Conn.
Wood Mfg. Co., Fairfield, Conn.

LAMPS. Dash Board.

Dashboard & Gauge for Automobiles.
METAL SPECIALTIES MFG. CO., Chicago, Ill.
Culver-Stearn Mfg. Co., Worcester, Mass.

LAMPS, Incandescent.

Miniature.
Tungsten—Carbon—Nitrogen.
AMERICAN EVER READY WKS. OF NAT'L CARBON CO., Long Island City, N. Y.
BEACON MINIATURE ELEC. CO., 108 Duane st., New York, N. Y. (Imp.).
EDISON LAMP WKS. OF G. E. CO., Harrison, N. J.
HERZOG & DEMMERLE, 42 E. 23d st., New York, N. Y.
IMPORT SALES CO., 4 Stone st., New York, N. Y. (Imp.).
INTERSTATE ELECTRIC NOVELTY CO., 29 Park pl., New York (Imp.).
MANNWEILER CO., A. C., Fort Wayne, Ind.
McCANDLESS & CO., H. W., 67 Park pl., New York, "Empire."
SCHAFFER CO., MAX, 26 Warren st., New York (Imp.).
STANDARD ELEC. NOVELTY CO., 10 N. Desplaines st., Chicago, Ill.
VOSBURGH MINIATURE LAMP CO., 287 Valley road, West Orange, N. J.
WOOD ELEC. CO., C. D., 136 Liberty st., N. Y. (Imp. "Merkle).
Aladdin Elec. Co., Chicago, Ill.
Alpha Lamp Co., Harrison, N. J.
Bronx Elec. Co., Chicago, "Beco."
Chicago (Ill.) Miniature Lamp Wks.
Deuth & Co., New York (Imp.), "Deco."
Domestic Tungsten Lamp Co., West New York, N. J.
Domestic Tungsten Lamp Mfg. Co., Weehawken, N. J.
Elux Miniature Lamp Div. Nat'l Lamp Wks. of G. E. Co., New York.
Federal Miniature Lamp Division National Lamp Wks. of G. E. Co., Chicago, Ill.
Jaeger Co., H. J., Hoboken, N. J.
Tipless Lamp Co., Emporium, Pa.
Tulite Auto Bulb Co., Detroit, Mich.
U. S. Inc. Lamp Co., St. Louis, Mo.
Weehawken (N. J.) Tungsten Lamp Co. (Tungsten).

LAMPS, Incandescent.

Nitrogen.
GENERAL ELECTRIC CO., Schenectady, N. Y.
GREENWICH SALES CO., 257 Broadway, New York (Imp.).
LUX MFG. CO., Terminal bldg., Hoboken, N. J.
Deuth & Co., New York.
D-M Lamp Co., New York (Imp.).
Laco-Phillips Co., New York (Imp.).
New York (N. Y.) Elec. Lamp Co.
Westinghouse Lamp Co., New York.

LAMPS, Incandescent.

Renewed Carbon.
Rewired Tungsten.
BOSTON-ECONOMY LAMP DIV., Nat'l Lamp Wks. of G. E. Co., 128 Maple st., Danvers, Mass.
Danvers (Mass.) Tungsten Lamp Co. (Rewire Tungsten Lamp).
Essex Lamp Co., Danvers, Mass.
Holscher Elec'l Mfg. Co., Warren, Ohio (Rewired Tungsten).
Newman Elec. Lamp Co., Cincinnati.
Re-New Lamp Co., Boston, Mass., "Malden."
Safety Electric Co., Chicago, Ill.
Security Elec. Lamp Co., Chicago, Ill.

LAMPS, Incandescent.

Standard and Mogul Base.
Tungsten. Glower.
Mazda. Tubular.
Carbon Turndown
AETNA ELECTRIC DIVISION OF FRANKLIN ELECTRIC MFG. CO., Hartford, Conn.
CONSOLIDATED ELECTRIC LAMP CO., Tapleyville Station of Danvers, Mass.
"Champion" Carbon Filament.
EDISON LAMP WKS. OF G. E. CO., Harrison, N. J., "Edison Mazda" Drawn Wire.
GILMORE ELECTRIC DIVISION OF FRANKLIN ELECTRIC MFG. CO., Hartford, Conn.
GREENWICH SALES CO., 257 Broadday, New York, N. Y. (Imp.).
"Titan" Tungsten Lamp.
HYGRADE INCANDESCENT LAMP CO., Danvers, Mass.
LUX MFG. CO., Terminal Bldg., Hoboken, N. J.
"Flexilux" Tungsten.
NATIONAL LAMP WKS. OF GENERAL ELEC. CO., Nela Park, Cleveland, O. Members of are
Am. El. Lamp Div., Central Falls.
Banner Elec. Div., Youngstown, O.
Brilliant Elec. Div., Cleveland, O.
Bryan-Marsh Div., Central Falls, R. I., Chicago, Ill.
Buckeye Elec. Div., Cleveland, O.
Colonial Elec. Div., Warren, O.
Columbia Lamp Div., St. Louis.
Economical Elec. Lamp Div., N. Y.
Elux Miniature Lamp Div., N. Y.
Fostoria (O.) Inc. Lamp Div.
Gen. Inc. Lamp Div., Cleveland, O.
Monarch Inc. Lamp Div., Chicago.
Munder El. Div., Central Falls.
Packard Lamp Div., Warren, O.
Peerless Lamp Div., Warren, O.
Shelby Lamp Div., Shelby, O.
Standard Elec. Div., Warren, O.
Sterling El. Lamp Div., Warren, O.
Sunbeam Inc. Lamp Div., Chicago.
Zokul El. Lamp Div., Cleveland, O.
ROONEY LAMP CO., F. J., Hoboken, N. J. "World" Carbon, "Sunstar Tungsten.
STERLING ELEC. LAMP DIV. NATIONAL LAMP WKS. OF GEN. ELEC. CO., Warren, O.
"National Quality Mazda."
"Frontlite."
Capital Electric Co., Denver, "Hall."
Deuth & Co., New York, N. Y. (Imp. "Desco" Tungsten Lamps).
D-M Lamp Co., New York (Imp.).
Duhessen & Pfaltz, New York (Imp.), ("Sunlite" Reflector).
Farkas Lamp & Wire Co., Hoboken
Franklin Electric Mfg. Co., Hartford, Conn., "Femco," "Novl."
(Divisions of)
Aetna El. Co., Hartford, Ct.
Eastern El. Lamp Co., Hartford, Ct.
Gilmore El. Div., Hartford, Ct.
Liberty El. Mfg. Co., Pittsbrgh.
Holscher Elec'l Mfg. Co., Warren, O., "Model."
Independent Lamp & Wire Co., New York, N. Y. (Tungsten).
Johns-Manville Co., New York, "Linolite," "Tubular."
Kentucky Elec'l Co., Owensboro, Ky.
Laco-Phillips Co., New York, N. Y., Importers "Kalcid," "Laco," Tungsten.
Marelli & Co., Ercole, Ltd., New York, N. Y.
Metalyte Co., New York, N. Y. ("Hy-ray" Tungsten).
M. & W. Elec. Co., Springfield, Mass.
New York (N. Y.) Elec. Lamp Co.
"Best" Carbon Filament.
"Regent" Metal Filament.
Novelty Incandescent Lamp Co., Emporium, Pa.
Pittsburgh Elec. Specialty Co., Pittsburgh, Pa. ("Nernst" Glower).
Straight Filament Lamp Co., N. Y. ("O'Brien" Tube), ("Rayline").
U. S. Inc. Lamp Co., St. Louis, Mo.
Western Lamp Co., Los Angeles, Cal.
Westinghouse Lamp Co., New York. "Lumino" Wire Type; also "Mazda."

LAMPS, INSPECTION.—See Flashlights; also Lamps, Trouble.

LAMPS, Photo Engraving.

Photo Engraving—Photographic.
BENJAMIN ELEC. MFG. CO., 120 S. Sangamon st., Chicago, Ill., "Ortholite."

"PACIFIC SERVICE" FURNISHES ALL OF THE ELECTRIC ENERGY AND GAS FOR THE ILLUMINATION OF THE EXPOSITION BUILDINGS AND GROUNDS AND FOR ALL POWER USED BY THE EXPOSITION AND BY EXHIBITORS

MANAGED BY CALIFORNIANS **OPERATED BY CALIFORNIANS**

"PACIFIC SERVICE" REPRESENTS

4,648	employees in all Departments.
$125,000,000.00	capital invested in Gas, Electricity, Railroads and Water Plants.
38,000	square miles of territory in which it operates.
6,243	men and women as stockholders, of which
1,630	employees are stockholders.
30	counties of the State in which it transacts business.
380,000	consumers served with gas, electricity, water and steam.
1,200,000	people served in **30** counties.
177	cities and towns in which it transacts business.
$5,300,000.00	annual wages paid employees in 1914.
$3.07	average daily wage paid each employee in 1914.
$12,141,500.00	expended in 1914 in California for labor and material.
$722,994.00	taxes paid to the State of California in 1914.
120,000	horsepower developed in **10** electric water-power plants.
110,000	horsepower developed in **4** electric steam plants.
230,000	total electrical horsepower developed in **14** plants.

7,600,000,000	cubic feet of gas sold in 1914. **This amount of gas would fill a holder covering the Exposition ground and 270 feet in height.**
17	gas plants.
19,000	miles of wire used in distributing electricity.
2,500	miles of mains used in distributing gas.
700	miles of mains and ditches used in distributing water.
600	miles of tracks of street railways operated and supplied with power.
40,000,000,000	gallons of water stored in **62** lakes. This amount of water would cover the Exposition site 200 feet in depth, or would supply the City of San Francisco for 800 days.
44,000	acres of land owned in California.
1,812,582	barrels of California oil used in 1914.
50,000	horsepower in agriculture depending on Pacific Service.
155,000	horsepower in industrials depending on Pacific Service.
33,000	street lamps, gas and electric, lighted by Pacific Service.
3,000,000	incandescent lamps nightly lighted.
478,598	horsepower connected to system. This represents the equivalent energy of 2,500,000 men.

THE PARTICIPATION OF "PACIFIC SERVICE" IN THE PANAMA-PACIFIC INTERNATIONAL EXPOSITION REPRESENTS

The spirit and energy of 10,891 employees, officers and stockholders of the Pacific Gas and Electric Company daily employed in the effort to make the Panama-Pacific International Exposition the success which the efforts of its officers, employees, architects, sculptors, artists and participants deserve for their individual and collective work.

"Palmam qui meruit ferat."

PACIFIC GAS AND ELECTRIC COMPANY

GENERAL OFFICES:

445 Sutter Street **San Francisco, Cal.**

GENERAL ELECTRIC CO., Schenectady, N. Y.
Adams-Bagnall Elec. Co., Cleveland.
Allison & Hadaway, New York, "Panchroma."
Am. Aristotype Co., Jamestown, N. Y.
Bogue El. Co., Chas. J., New York.
Cooper Hewitt Elec. Co., Hoboken.
Eastman Kodak Co., Rochester, N. Y., "Aristo."
Gray, R. D., Ridgewood, N. J., "Parallax."
Macbeth Arc Lamp Co., Philadelphia.
New York Engravers' Supply, New York, N. Y., "Panchros."
Radio Elec. Co., New York, N. Y.
Simplex Photo Products Co., Morris Park, L. I., "Multiflex."
Thompson & Co., A. T., Boston.
Toerring Co., C. J., Philadelphia, Pa.
Wiehl & Co., M. J., Brooklyn, N. Y.
Williams-Lord Mch. Co., Chicago, "Winfield."

LAMPS, PORTABLE.—See Guards, Portable Lamp; also Lamps, Trouble.

LAMPS, READING—See Portables.

LAMPS, Stereopticon and Stage.

Chicago Stage Ltg. Co., Chicago, Ill.
Keller & Co., P., New York, "Colt."
McIntosh Stereopticon Co., Chicago.
Newton, C. I., New York, N. Y.
Universal Elec. Stage Lighting, New York, "Kliegl."

LAMPS, Trouble.

(Automobile, Portable, Hand.)
AMERICAN EVER READY WKS. OF NAT'L CARBON CO., Long Island City, N. Y.
BENJAMIN ELEC. MFG. CO., 120 S. Sangamon st., Chicago, Ill.
CONNECTICUT TELE. & ELECTRIC CO., Meriden, Conn.
McGILL MFG. CO., 39 Oak st., Valparaiso, Ind.
MANHATTAN ELEC. SUPPLY CO., 17 Park pl., N. Y., "Mesco."
METAL SPECIALTIES MFG. CO., 748 W. Monroe st., Chicago, Ill., "Presto."
MORSE, FRANK W., Boston, Mass.
PROVIDENCE ELECTRIC MFG. CO., Providence, R. I., "Nitelite."
ROSEN & CO., A. W., 610 Broadway, New York.
STANLEY & PATTERSON, 23 Murray st., New York, N. Y.
Adams-Bagnall Elec. Co., Cleveland, O. ("A-B" Magnetic).
American Enamel Co., Providence, R. I., "Britelite."
Campbell Co., A. S., Boston, Mass., "Cello."
Columbus (O.) Auto Brass Co.
Culver Stearns Mfg. Co., Worcester.
Electric City Sales Co., Marion, Ind.
Franklin Specialty Co., Worcester.
Harvard Elec. Co., Chicago, Ill.
Indiana Elec'l Supply Co., Terra Haute, Ind.
Mabey's Elec. & Mfg. Co., Indianapolis, Ind.
Millar Elec. Wks., R. M., Chicago, Ill. ("X. L." Trouble Chaser).
Niagara Falls (N. Y.) Searchl't Co.
Premier Elec. Co., Chicago, Ill., "Stickalite."
Superior Lamp Mfg. Co., New York.
Varney Elec'l Supply Co., Indianapolis, Ind.
Williamson Co., L. A., New York.

LAMPS, Vapor.

GENERAL ELECTRIC CO., Schenectady, N. Y., "Moore."
Cooper Hewitt Elec. Co., Hoboken, N. J., "Targon."
Rectigraph Co., Rochester, N. Y.

LANTERNS.—See Flashlights.

LATHES, Metal Spinning.

PRYBIL MACHINE CO., P., 512 W. 41st st., New York.
WILCOR MFG. CO., 4824 W. Lake st., Chicago, Ill., "Schulz."
Grabo Machine Wks., New York.

LAUNDRY MACHINERY.

Names of manufacturers of motor driven laundry machinery will be furnished on request by the Gage Publishing Co., 114 Liberty st., New York.

LAVA.

KIRCHBERGER & CO., M., 378 2d ave., New York, N. Y., "Crescent."
Am. Lava Co., Chattanooga, "Alco."
Colonial Mfg. Co., Chattanooga.
Novelty Burner Co., Chattanooga.
Steward Mfg. Co., D. M., Chattanooga, Tenn., "Lavite."

LEAD ENCASED CABLES.
See Wire, Lead Encased.

LEATHER WASHERS.
See Washers, Leather.

LEAVES—See Decorative.

LENSES, Flashlight.

CONSOLIDATED LAMP & GLASS CO., Coraopolis, Pa.
MACBETH-EVANS GLASS CO., Pittsburgh, Pa.
SIEGMAN & WEIL, 18 East 27th st., New York, N. Y.
Corning Glass Co., Corning, N. Y.
Jefferson Glass Co., Follansbee, W. Va.
Popper & Son, Leo., New York.
Spencer Optical Co., New York.

LETTER BOXES.
See Boxes, Letter.

LETTERS, Sign (Glass).

Pressed Prism Plate Glass Co., Chicago, Ill., "Heralite."

LICENSE NUMBERS.
See Numbers, Automobile.

LIFTING MAGNETS.
See Magnets, Lifting.

LIGHTERS, Acetylene.

Elliott Auto-Lighter Co., Baltimore.
Inst. Lighter Co., Columbus, O.
Motors Specialty Co., Waltham, Mass., "Frary."
Samson Elec. Co., Canton, Mass., "Advance."

LIGHTERS, Cigar.

AMERICAN ELEC'L HEATER CO., Detroit, Mich.
AM. EVER READY WKS. OF NAT'L CARBON CO., Long Island City, N. Y., "Eveready."
GENERAL ELECTRIC CO., Schenectady, N. Y.
IMPORT SALES CO., 19 East 21st st., New York, N. Y., "Electra."
INTERSTATE ELECTRIC NOVELTY CO., 29 Park pl., New York, N. Y., "Franco."
METAL SPECIALTIES MFG. CO., 748 W. Monroe st., Chicago, Ill., "Presto."
WHITE MFG. CO., J. H., 111 N. Third st., Brooklyn, N. Y.
Cowles & Co., C., New Haven, Conn.
Eldred Mfg. Co., Chicago, "Wizard."
Electric Automatic Cigar Lighter, New York, N. Y.
Goodman Elec. Co., Chicago, Ill.
Knoblock-Heideman Mfg. Co., South Bend, Ind.
Presto El. Co., San Francisco, Cal.
Standard Mfg. Co., Auburn, Ind. (Pendant), "Crown."

LIGHTERS, Gas.

Meaning a Torch.
AM. EVER READY WKS. OF NAT'L CARBON CO., Long Island City, N. Y., "Eveready."
STANLEY & PATTERSON, New York, N. Y., "Matchless."
Bogart Co., A. L., New York, N. Y., "Bartholdi."
Cowles & Co., C., New Haven, Conn.
Universal Novelty Co., New York, N. Y., "Aladdin."

LIGHTING OUTFITS, AUTOMOBILE—See Systems, Auto.

LIGHTNING ARRESTERS.
See Arresters, Lightning.

LIGHTS, Bridge and Porch.

HERWIG ART SHADE & LAMP CO., 2140 N. Halstead st., Chicago, Ill. (Porch Lights).
Hart, J. G., Chicago, Ill.
Phila. Elec. & Mfg. Co., Phila., Pa.
Pittsburgh Valve & Fittings Co., Barberton, O.

LIGHTS, DESK. — See Portable; also Clamps, Lamp Attaching.

LIGHTS, STAGE.

Bunch, Foot, Spot, Strip.
CAMPBELL ELECTRIC CO., Lynn, Mass.
CONDIT ELECTRICAL MFG. CO., Boston, Mass., "Cushing."
GENERAL ELEC. CO., Schenectady, N. Y.
SPRAGUE ELEC. WKS. OF G. E. CO., 527 W. 34th st., New York.
Am. Reflector & Ltg. Co., Chicago.
Bailey Reflector Co., Pittsburgh, Pa.
Frankenstein, S., Chicago, Ill.
Huelsman & Moore, Cincinnati, O.
Kansas City Scenic Co., Kansas City.
Newton, C. L., New York, N. Y.
Overbagh & Ayres Mfg. Co., Chicago, "Oamco."
Pennefather, J. S., New York, N. Y.
Sunlight Reflector Co., Brooklyn, N. Y.
United Elec. Sales Co., New Orleans.
Universal Elec. Stage Lighting Co., New York, "Kliegl."

LIMIT SWITCHES.
See Switches, Reversing.

LIMOUSINE ANNUNCIATORS.
See Annunciators, Limousine.

LIMOUSINE TELEPHONES.
See Telephones, Limousine.

LINE MATERIAL.
See Specific Article.

LINEMEN'S DEVICES.
See Specific Article.

LININGS Socket.

Elastoid Fibre Co., Waltham, Mass.
Pairpoint Corp., New Bedford, Mass.
Sherman, C. L., Philadelphia, Pa., "Fibreo."

LINKS.—See Fuses, Open Link.

LINKS, Splicers & Insulators, Socket Chain.

BRYANT ELEC. CO., Bridgeport, Ct.
HARRIGAN, T. M., Woodstock, Vt.
HUBBELL, HARVEY, Bridgeport, Ct. "Abbott."
McKENNEY & WATERBURY CO., 181 Franklin st., Boston, Mass., "Malton" Splicing Links.
Arrow Electric Co., Hartford, Conn.
Harvey, W. A., Scranton, Pa.

LIQUID HEATERS.
See Heaters, Liquid.

LOCK NUTS.
See Fittings, Conduit.

LOCKING GUARDS.
See Guards, Locking.

LOCKING SOCKETS.
See Sockets, Locking.

LOCKS, Automobile.

BLACKBURN SPECIALTY CO., 3409 Perkins ave., Cleveland, O., "Eureka," "Comet."
CONNECTICUT TELE. & ELEC. CO., Meriden, Conn.
Baird Equipment Co., Chicago, Ill.

LOCKS, DOOR.—See Openers.

LOCKS, Lamp.

See also Sockets, Locking.
Ball, Frederick, New York, "E. Z." Sole Selling Agts.; E. Z. Mazda Lamp Lock Co., New York.
Elec. Globe Lock Co., Johnstown, Pa.

LOCKS, Pole.

CUTTER CO., GEO., 411 Notre Dame st., South Bend, Ind.
Line Material Co., So. Milwaukee, Wis.

LOCOMOTIVES, Electric.

GENERAL ELECTRIC CO., Schenectady, N. Y.
WESTINGHOUSE ELECTRIC & MFG. CO., Pittsburgh, Pa.
Atlas Car & Mfg. Co., Cleveland, O.
Baldwin Locomotive Works, Phila.
Goodman Mfg. Co., Chicago, Ill.
Hunt Co., C. W., West New Brighton, N. Y. (Storage Battery).
Jeffrey Mfg. Co., Columbus, Ohio.
McGuire-Cummings Mfg. Co., Chicago, Ill.
Pneumelectric Mach. Co., Syracuse.

LOCOMOTIVES, TOY.—See Toys.

LOOPS, FIXTURE.
See Fittings, Fixture, Brass.

LUBRICANTS.

DIXON CRUCIBLE CO., JOSEPH, Jersey City, N. J., "Graphite."

LUGS, Terminal.

BLISS-CHESTER CO., 31 Mathewson st., Providence, R. I., "Duplex."
CONDIT ELECTRICAL MFG. CO., Boston, Mass., "Shawmut."
CROUSE-HINDS CO., Syracuse, N. Y.
ELECTRICAL MFG. CO., 2163 E. 2nd st., Cleveland, O.
MANHATTAN ELECTRICAL SUPPLY CO., 17 Park pl., New York, N. Y.
METROPOLITAN ELECTRIC MFG. CO., 14th st. & East ave., Long Island City, N. Y.
STATES CO., Park st. cor. New Park ave., Hartford, Conn.
TRUMBULL ELECTRIC MFG. CO., Plainville, Conn.
TRUMBULL - VANDERPOEL ELEC. MFG. CO., Bantam, Conn.
Barkelew Elec. Mfg. Co., Middletown, O.
Dossert & Co., New York, N. Y.
Empire El. Mfg. Co., Plainville, Conn.
Fargo Mfg. Co., Poughkeepsie, N. Y.
French Mfg. Co., Waterbury, Conn.
General Devices & Fittings Co., Chicago, Ill.
Metropolitan Engrg. Co., New York.
Pringle Elec. Mfg. Co., Phila., Pa.
Worcester (Mass.) Elec. & Mfg. Co.

LUMINOUS RADIATORS.
See Radiators, Electric.

MACHINES, Armature.

Forms, Stands, Trucks, Taping Machines, Winding Machines, Coil Presses, Slotting Machines, Hoists.
Alley, F. R., Seattle, Wash. (Commutator Slotter).
American General Engineering Co., New York, N. Y., "A. G. E."
Chapman, P. E., St. Louis, Mo., "Universal" Armature Wind. Mch.
Chattanooga Armature Wks., Chattanooga, Tenn. ("Chatham" Taping Machine).
Columbia Machine Wks. & Malleable Iron Co., Brooklyn, N. Y.
Delahunty Dyeing Machine Co., Pittston, Pa. ("Comstock" Armature, Coil Formers and Presses).
Duff Mfg. Co., Pittsburgh, Pa., "Barrett" Jacks.
Elec. Mfrs. Equipment Co., Chicago, Ill. ("Segur" Coil Winder and Spreader).
Electric Service Supplies Co., Philadelphia, Pa.
Griswold, G. M., New Haven, Conn. (Taping Machines).
LaFayette (Ind.) Engineering Co. (Armature Hoists).
Ridlon Co., Frank, Boston, Mass.
Smith & Wallace, Woburn, Mass.
Tracy, James F., Sheridanville, Pa. (Testing Frame).

MACHINES, METAL STAMPING.
See Stamping Machines.

MACHINES, Pipe.

Threading & Cutting.
ARMSTRONG MFG. CO., 322 Knowlton st., Bridgeport, Conn.

MACHINES, Steel Bending.

Dreis & Krump Mfg. Co., Chicago, Ill.

MACHINES, Wire Covering and Stranding.

AMERICAN INSULATING MACHY. CO., N. E. cor. Fairhill & Huntington sts., Philadelphia, Pa.
Chernack Mfg. Co., Pawtucket, R. I.
Farrell Fdy. & Mach. Co., Ansonia, Conn.
New England Butt Co., Providence.
Rhode Island Braiding Machine Co., Providence, R. I.
Royle & Sons, John, Paterson, N. J.
Textile Machine Works, Reading, Pa.
Torrington (Conn.) Mfg. Co.
Wardwell Braiding Machine Co., Central Falls, R. I.

MACHINES, Wire Measuring.

MINNEAPOLIS ELEC. & CONSTRUCTION CO., Minneapolis, Minn.
WALDMAN, JOHN J., 136 Liberty st., New York, N. Y., "Jones."
New England Butt Co., Providence.
Root Co., Bristol, Conn., "Roco."
Tontile Machine Works, Reading Pa.

MAGNET STEEL—See Steel, Magnet.

MAGNET WIRE. See Wire, Magnet.

MAGNET WINDERS.
See Winders, Magnet.

MAGNETIC CLUTCHES.
See Clutches, Magnetic.

MAGNETIC SEPARATORS.
See Separators, Magnetic.

MAGNETIC SOCKETS.
See Sockets, Magnetic Holding.

MAGNETO BELLS.
See Telephones & Switchboards.

MAGNETOMETERS.
See Instruments, Testing.

MAGNETOS, BLASTING.
See Blasting Apparatus.

MAGNETOS, IGNITION.
See Ignition Outfits.

MAGNETS.

Finished Magnets & Magnet Steel.
LINDENBERG STEEL CO., 90 West st., New York, N. Y.

MAGNETS, ELECTRO.

ACME WIRE CO., New Haven, Conn.
BELDEN MFG. CO., 2308 So. Western ave., Chicago, Ill.
BUNNELL & CO., J. H., 32 Park pl., New York, N. Y.
MANHATTAN ELECTRICAL SUPPLY CO., 17 Park pl., New York.
STANLEY & PATTERSON, 23 Murray st., New York, N. Y.
Splitdorf Elec. Co., Newark, N. J.
Thordarson Elec. Mfg. Co., Chicago.

MAGNETS, Lifting.

Magnetic Hoists.
CUTLER-HAMMER CLUTCH CO., Milwaukee, Wis.
Browning Engineering Co., Cleveland.
Elec. Controller & Mfg. Co., Cleveland.
K. & B. Company, Philadelphia, Pa. (Hand).

MAGNETS, Permanent.

LINDENBERG STEEL CO., 90 West st., New York, N. Y.
Boker & Co., H., N. Y. (Importers).
Esterline Co., Indianapolis, Ind.
Indiana Steel Products Co., Valparaiso, Ind.
Utica (N. Y.) Fire Alarm Teleg. Co.

MANGANESE.
See Chemicals, Battery.

MANHOLE APPLIANCES.
See Specific Article.

MANIPULATORS, Inc. Lamp.

Replacers, Cleaners, Manipulators.
LATHAM & CO., E. B., 4 Murray st., New York, N. Y., "Imperial."
MATTHEWS & BRO., W. N., 3705 Forest Park blvd., St. Louis, Mo., "Easy" changer.
MORSE, FRANK W., Boston, Mass. ("Handy" Cleanser and Replacer).
Gaynor Elec. Bulb Manipulator Co., New York, N. Y., Replacers.

We compliment

the electrical industry of this
country upon the conception
and plan of the coming

San Francisco Convention

of

National Electric Light
Association

THE occasion, the thirty-eighth of its kind, is to take place under conditions peculiarly auspicious. That the most may result both for the Association and the industry as a whole is the hearty wish of

The New York Edison Company

MANUFACTURERS' AGENTS.
See Pages 202-203-204

MARBLE BOWLS.
See Bowls, Marble & Alabaster

MARBLE, Switchboard.

Clow & Sons, James B., Chicago, Ill.
De Paoli Mosaic Association, Boston.
Evans Marble Co., Baltimore, Md.
Klaber & Son, A., Long Island City.
Rutland-Florence Marble Co., Rutland, Vt.
Vermont Marble Co., Proctor, Vt.

MARINE FIXTURES.
See Fixtures, Marine.
MARINE SIGNALS.
See Signals, Marine.
MARLIN HANGERS.
See Hangers, Cable.
MASSAGE VIBRATORS.
See Vibrators, Massage.
MAST ARMS—See Arms, Mast.
MATS, SWITCH.
See Switches, Battery.

MATTING, Elec. Alarm.

PARTRICK & WILKINS CO., Philadelphia, Pa.

MATTING, Insulating.

WALPOLE TIRE & RUBBER CO., Walpole, Mass.

N. Y. Belting & Packing Co., N. Y.

MAXIMUM METERS.
See Instruments, Integrating.
MEASURING MACHINES.
See Machines, Wire Measuring.
MEAT CHOPPERS.—See Choppers.
MEDICATORS.—See Perfumers.
MELTING POTS. See Pots, Melting.
MERIDIAN LAMPS.
See Lamps, Inc., Standard.
METAL SPINNING.
See Shells, Chandelier.
METAL WASHERS. See Washers.

METAL WORKING MACHINERY.

Names of manufacturers of motor driven metal working machinery will be furnished on request by the Gage Publishing Co., 114 Liberty st., New York.

METER CLEANERS.
See Cleaners, Meter.
METER SEALS—See Seals.
METER TERMINAL BOXES.
See Boxes, Meter Terminal.
METERING PANELS.
See Switchboards, Lt. & Pr.
METERS—See Instruments.

METERS, Gas.
(Electrically Operated.)

CUTLER-HAMMER MFG. CO., Milwaukee, Wis., "Thomas."

METERS, Register, and Toll Boxes. Tele.

Am. Elec. Co., Chicago, "National."
Graeber-Entriken Mfg. Co., Phila., Pa. ("Invincible" Toll Box).
Gray Telephone Pay Station Co., Hartford, Conn.
Telechronometer Co., Rochester, N. Y.
Turner Brass Works, Sycamore, Ill., "Telometer."

MICA.

AMERICAN MICA CO., Newton Lower Falls, Mass., "Micabeston."
CHICAGO MICA CO., Valparaiso, Ind., "Micabond."
KEENE MICA PRODUCTS CO., Keene, N. H.
MACALLEN CO., Macallen & Foundry sts., Boston, Mass. (Compressed).
MEIROWSKY BROS., 106 Broadway, Jersey City, N. J., "Excelsior," "Megohmite," "Royal."
MICA INSULATOR CO., 68 Church st., New York, N. Y., "Micanite."
MICA MFG. CO., 150 Chambers st., New York, N. Y.
MUNSELL & CO., EUGENE, 68 Church st., New York, N. Y.
REPUBLIC MICA CO., Inc., 46 West Broadway, New York, N. Y., "Remico."
SCHOONMAKER CO., A. O., 66 Park pl., New York, N. Y.
WATSON BROS., 170 Purchase st., Boston, Mass.

Asheville (N. C.) Mica Co.
Burleson Mica Co., Spruce Pine, N. C.
Dielectric Mfg. Co., St. Louis, Mo., Compressed Sheet Mica.
Granite State Mica Co., Boston, Mass.
Kasson, Arthur R., Camden, N. J.
New York Mica & Mfg. Co., Auburn, N. Y.
Preston Co., Robt. K., Chicago, Ill.
Star Mica Mining Co., Canaan, N. H.
Tar Heel Mica Co., Plumtree, N. C.
U. S. Mica Mfg. Co., Chicago, Ill.

MILK WARMERS.
See Heaters, Liquid.
MILKERS, COW.
See Farm Equipment.
MILLED SCREW PRODUCTS.
See Screw Machine Products.
MILLI-AMMETERS AND VOLT-METERS.—See Instruments.

MILLS, Coffee.
(Motor Driven.)

Angldile Computing Scale Co., Elkhart, Ind.
Coles Mfg. Co., Philadelphia, Pa.
Computing Scale & Fixture Co., Cincinnati, O.
Deer Co., Hornell, N. Y., "Royal."
Electric Cut Coffee Mill Co., Canton, O.
Enterprise Mfg. Co., Philadelphia.
Hobart Electric Mfg. Co., Troy, O.
Holwick, B. C., Canton, O.
Post-Meinecke Co., St. Louis, Mo.
Stimson Scale & Mfg. Co., Northville, Mich.
Universal Store Specialties Co., New Britain, Conn.

MINIATURE LAMPS.
See Lamps, Inc., Miniature.

MINING MACHINERY.

Names of manufacturers of motor driven mining machinery will be furnished on request by the Gage Publishing Co., 114 Liberty st., New York.

MIRROR LAMP CLAMPS.
See Clamps, Lamp Attaching.

MIRRORS, Shaving & Toilet
(Electrically Lighted.)

FEDERAL SIGN SYSTEM (ELEC.), Lake & Desplaines sts., Chicago, Ill.

Alexander Mfg. Co., J., New York.
Holophane Wks., of G. E. Co., Cleveland, O., "Mirrorlite."
McLeod Ward & Co., New York.

MIXERS, Drink.

LINDSTROM-SMITH CO., 1100 S. Wabash ave., Chicago, Ill.
WISCONSIN ELEC. CO., 1635 Junction ave., Racine, Wis., "Dumore."

Arnold Elec. Co., Racine, Wis.
Hamilton-Beach Mfg. Co., Racine, Wis., "Cyclone," "U-See-Us."
Seifke & Co., H. A., San Francisco, Cal., "Marvelous."

MOGUL SOCKETS. — See Sockets and Receptacles, Standard.
MOPS, FLOOR. See Cleaners, Floor.
MOTOR BOAT LTG. & STARTING.—See Systems, Auto.

MOTOR-GENERATORS.
Motor Generators.
Rotary Converters.

BELL ELEC. MOTOR CO., Garwood, N. J.
BODINE ELEC. CO., Oakley blvd. & Ohio st., Chicago, Ill. (Also Rotary Converters).
CROCKER-WHEELER CO., Ampere, N. J.
DIEHL MFG. CO., Elizabeth, N. J.
ECK DYNAMO & MOTOR CO., Belleville, N. JJ.
FIDELITY ELEC. CO., Lancaster, Pa. (Also Rotary Converterss).
FORT WAYNE ELECTRIC WORKS OF GENERAL ELEC. CO., 1612 Broadway, Fort Wayne, Ind. (Also Rotary Converters).
GENERAL ELECTRIC CO., Schenectady, N. Y. (Also Rotary Converters).
HOLTZER-CABOT ELECTRIC CO., Boston, Mass. (Also Rotary Converters).
LINCOLN ELECTRIC CO., 38th st. and Kelley ave., Cleveland, O.
MECHANICAL APPLIANCE CO., Milwaukee, Wis. (Also Rotary Converters).
NORTHWESTERN ELEC. CO., 613 W. Adams st., Chicago, Ill. ("Martin" Rotary Converter).
PEERLESS ELECTRIC CO., Warren, O. (Rotary Converters Only).
ROCHESTER MOTORS CO., 686 Lexington ave., Rochester, N. Y. (Also Rotary Converters).
ROTH BROS. & CO., 1396 W. Adams st., Chicago, Ill. (Also Rotary Converters).
SPRAGUE ELEC. WORKS OF GENERAL ELEC. CO., 527 W. 34th st., New York, N. Y.
WAGNER ELECTRIC MFG. CO., St. Louis, Mo. (Also Rotary Converters).
WESCHE ELECTRIC CO., B. A., Cincinnati, O. (Also Rotary Converters).
WESTERN ELECTRIC CO., New York, N. Y.
WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa. (Also Rotary Converters).

Advance Electric Co., St. Louis, Mo.
American Rotary Valve Co., Anderson, Ind.
Birtman Elec. Co., Chicago, Ill.
Bogue Electric Co., Chas. J., N. Y.
Burke Electric Co., Erie, Pa.
Clark, Jr., Elec. Co., James, Louisville, Ky.
Colonial Fan & Motor Co., Warren, O. (Also Rotary Converters).
Connecticut Dynamo & Motor Co., Irvington, N. J.
C. & C. Electric & Mfg. Co., Garwood, N. J. (Also Rotary Converters).
Eager Elec. Co., Watertown, N. Y.
Electric Specialty Co., Stamford, Ct. (Also Rotary Converters).
Hertner Elec. & Mfg. Co., Cleveland.
Ideal Elec. & Mfg. Co., Mansfield, O. (Also Rotary Converters).
Northwestern Mfg. Co., Milwaukee (Also Rotary Converters).
Pan-Electric Mfg. Co., St. Louis, Mo. (Also Rotary Converters).
Reliance Elec. & Engng. Co., Cleveland, O.
Ridgway (Pa.) Dynamo & Engine Co.
Ritter Dental Mfg. Co., Rochester, N. Y. (Also Rotary Converters).
Star Dynamo Works, Jefferson City, Mo.
U. S. Elec. Mfg. Co., Los Angeles (Also Rotary Converters).
Victor Elec. Co., Chicago, Ill. (Also Rotary Converters).

MOTOR STARTING & CONTROLLING DEVICES — See Rheostats; also Switches, Motor Starting; also Starters, Motor.

MOTORS, Automobile.
For Electric Vehicles.

GENERAL ELECTRIC CO., Schenectady, N. Y.
WAGNER ELEC. MFG. CO., St. Louis, Mo.
WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa.

MOTORS, BATTERY.—See Toys.

MOTORS, Power.

ARROW MFG. CO., Snowflake Bldg., Toledo, O. (Small Motors).
BELL ELEC. MOTOR CO., Garwood, N. J.
BISSELL CO., F., Toledo, O. (Sewing Machine Motors).
BODINE ELEC. CO., Oakley blvd. & Ohio st., Chicago, Ill.
CARLETON CO., 174 Summer st., Boston, Mass.
CENTURY ELEC. CO., 19th, Pine & Olive sts., St. Louis, Mo., "Invincible."
CLEVELAND ARMATURE WORKS, 49 St. Clair ave., Cleveland, O.
CROCKER-WHEELER CO., Ampere, N. J.
DAVIDSON MACHINE CO., 508 N. 12th st., Philadelphia, Pa. (Small Motors).
DIEHL MFG. CO., Elizabeth, N. J.
ECK DYNAMO & MOTOR CO., Belleville, N. J.
EMERSON ELEC. MFG. CO., 2032 Washington ave., St. Louis, Mo.
FIDELITY ELEC. CO., Lancaster, Pa., "Eclipse."
FORT WAYNE ELECTRIC WORKS OF GENERAL ELEC. CO., 1612 Broadway, Fort Wayne, Ind., "Northern."
GENERAL ELECTRIC CO., Schenectady, N. Y.
HOLTZER-CABOT ELECTRIC CO., Boston, Mass.
KNAPP ELEC. & NOVELTY CO., 509 W. 51st st., New York, N. Y.
LINCOLN ELECTRIC CO., 38th st. and Kelley ave., Cleveland, O.
LINDSTROM-SMITH CO., 1100 So. Wabash ave., Chicago, Ill.
MECHANICAL APPLIANCE CO., Milwaukee, "Watson," "B. T."
PEERLESS ELECTRIC CO., Warren, Ohio.
PHOENIX ELECTRIC CO., Mansfield, O.
REYNOLDS ELECTRIC CO., 422 S. Talman ave., Chicago, Ill. ("Reco" Small Motors).
ROBBINS & MYERS CO., Springfield, O., "Standard."
ROCHESTER MOTORS CO., 686 Lexington ave., Rochester, N. Y.
ROTH BROS. & CO., 1396 W. Adams st., Chicago, Ill.
SPRAGUE ELEC. WORKS OF GENERAL ELEC. CO., 527 W. 34th st., New York, N. Y., "Lundell."
WAGNER ELECTRIC MFG. CO., St. Louis, Mo.
WESCHE ELECTRIC CO., B. A., Cincinnati, O., "Swing."
WESTERN ELECTRIC CO., New York, N. Y.
WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa.
WISCONSIN ELEC. CO., 1635 Junction ave., Racine, Wis., "Dumore."

Advance Electric Co., St. Louis, Mo.
Allis-Chalmers Mfg. Co., Milwaukee, Wis., "Bullock."
Am. Arc Lamp, Kalamazoo, Mich.
Am. Eng. & El. Co., Bound Brook, N.J.
American Rotary Valve Co., Anderson, Ind., "Jenney."
Atwater Elec. Wks., Coopersville, N. Y.
Barnes Mfg. Co., Susquehanna, Pa. (Small Motors).
Benton Elec. Co., La Crosse, Wis.
Birtman Elec. Co., Chicago, Ill. ("Bee" Small Motors).
Bogue Electric Co., Chas. J., N. Y.
Braun Elec. Mfg. Co., Canal Dover, O.
Burke Electric Co., Erie, Pa.
Champion Elec. Mfg. Co., New York (Small).
Clark, Jr., Elec. Co., James, Louisville, Ky., "Willey."
Cline Elec. Mfg. Co., Chicago, Ill.
Colonial Fan & Motor Co., Warren, O.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Cronk, E. D. & A. F., Utica, N. Y.
Cushman Elec. Co., Concord, N. H.
C. & C. Elec. & Mfg. Co., Garwood, N. J.
Dienelt & Eisenhardt, Philadelphia.
Dilg Mfg. & Trading Co., New York.
Eager Elec. Co., Watertown, N. Y.
Electric Machinery Co., Minneapolis.
Electric Specialty Co., Stamford, Conn.
Electro-Dynamic Co., Bayonne, N. J.
Engberg's Electrical & Mechanical Works, St. Joseph, Mich.
Excello Mfg. Co., Chicago, Ill.
Fairbanks, Morse & Co., Chicago.
Fisher Elec'l Wks., Detroit, Mich.
Globe Elec. Co., Chicago, Ill.
Hobart Bros. Co., Troy, O.
Holt Elec. Co., Milwaukee, Wis.
Ideal Elec. & Mfg. Co., Mansfield, O.
Imperial Elec. Co., Akron, O.
Jantz & Leist Elec. Co., Cincinnati.
Kentucky Elec'l Co., Owensboro, Ky.
Kalamazoo (Mich.) Elec. Motor Co., "Kazoo."
Kester Elec. Co., Terre Haute, Ind.
Kimble Elec. Co., Chicago, Ill.
Kurz & Root, Appleton, Wis.
Lanigan & Rosemont Elec. Co., New York (Small Motors).
Marelli & Co., Ltd., Ercole, New York, N. Y.
Northwestern Electric Equipment Co., St. Paul, Minn.
Northwestern Mfg. Co., Milwaukee.
Olson-Boettger Elec. Mfg. Co., St. Paul, Minn.
Pan-Electric Mfg. Co., St. Louis, Mo., "Chandeysson."
Reliance Elec. & Engrg. Co., Cleveland, O.
Reno-Kaetker Elec. Co., Cincinnati, O.
Rice Elec. Motor Co., Chicago, Ill.
Ridgway Dynamo & Engine Co., Ridgway, Pa., "Thompson-Ryan."
Ritter Dental Mfg. Co., Rochester, N. Y. (Dental).
Shodd Elec. Co., Roselle, N. J.
Standard Elec. Motor Co., Chicago.
Star Dynamo Wks., Jefferson City, Mo.
Stecker Electric & Machine Co., Detroit, Mich. (Small Motors).
Steiner Mfg. Co., St. Louis, Mo. (Family Motors).
Stow Mfg. Co., Binghamton, N. Y.
Triumph Elec. Co., Cincinnati, O.
Troy Elec'l Co., Troy, N. Y.
U. S. Electrical Mfg. Co., Los Angeles, Cal., "Usemco."
Victor Elec. Co., Chicago, Ill. (Small).
Virginia Electric & Machine Works, Charleston-Kanawha, W. Va.

MOTORS, Water.

CARLISLE & FINCH CO., 221 E. Clifton ave., Cincinnati, O.

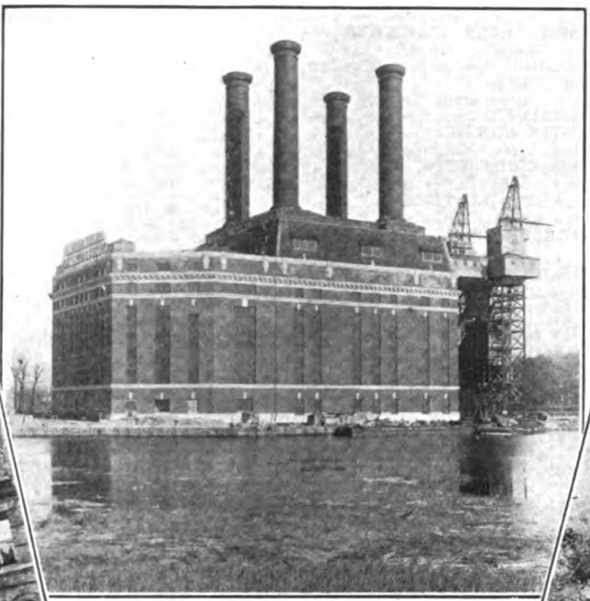
MOULDED INSULATION.

BELDEN MFG. CO., 2308 So. Western ave., Chicago, Ill., "Belden-Bakelite."
BOONTON RUBBER MFG. CO., Boonton, N. J., "Hi Tensit."
CONDENSITE CO. OF AMERICA, Bloomfield, N. J.
CONTINENTAL FIBRE CO., Newark, Del., "Bakelite-Dilecto" (Sheet, Rod & Tube).
CUTLER-HAMMER MFG. CO., Milwaukee, Wis., "Thermoplax."
DICKINSON MFG. CO., Springfield, Mass., "Sternoid," "Stern-Condensite."
DURANOID MFG. CO., 213 Chestnut st., Newark, N. J. (Composition).
GENERAL BAKELITE CO., 100 William st., New York, "Bakelite."
GENERAL INSULATE CO., 1010 Atlantic ave., Brooklyn, N. Y.
LOVERING CO., C. P., East Cambridge, Mass.
MACALLEN CO., Macallen & Foundry sts., Boston, Mass.
SCRANTON BUTTON CO., Scranton, Pa. ("Electroid" Composition).
STEVENSON CO., Wilkinsburg Station, Pittsburgh, Pa.
WESTINGHOUSE ELEC. & MFG. CO., East Pittsburgh, Pa., "Micarta."

Auburn Button Works, New York.
Electrose Mfg. Co., Brooklyn, N. Y. (Composition).
Essex Rubber Co., Trenton, N. J.
Formica Insulation Co., Cincinnati, O.
Gary Co., Theo. H., New York, "Isolit."
Hemming Mfg. Co., Garfield, N. J., "Gummon," "Hemit," "Tegit" Composition.
Johns-Manville Co., H. W., New York, "Electrobestos," "J. P. Bakelite."
Northern Industrial Chemical Co., Boston, Mass., "Roxite."
Redmanol Chemical Products Co., Chicago, Ill.
Specialty Insulation Mfg. Co., Hoosick Falls, N. Y.
Sun Co., Philadelphia, Pa. ("Hydroline" Asphalt).
Taber Laboratories Corp., Wilmington, Del.
Vulcalloe Co., Chicago, Ill.
Vulcanized Products Co., Muskegon, Mich. (Composition), "Golinak."
Waterbury (Conn.) Button Co.
Watertown (Conn.) Mfg. Co.

MOULDED INSULATION INGREDIENTS—See Ingredients.
MOULDING BLOCKS.
See Blocks, Moulding.

45th Street Sub-station



201st Street Generating Station.

187th Street Sub-station

When in New York

do not fail to visit the 201st Street Generating Station and the Sub-stations of The United Electric Light and Power Company. Passes and competent guides may be obtained upon application to the General Offices of the Company. With our increased generating and transforming facilities and the material decrease in rates effective May 1st, 1915, the Company can now supply every requirement for ALTERNATING CURRENT, SINGLE and TWO-PHASE, throughout the Borough of Manhattan, City of New York.

The United Electric Light and Power Company

GENERAL OFFICES
130 East 15th Street, N. Y.
Telephone: 4980 Stuyvesant

BRANCH OFFICE AND SHOWROOM
138 Hamilton Place, N. Y.
Telephone: 4000 Audubon

NOTE: After July 1st, the Branch Office of the Company will be located at the north-west corner of Broadway and 146th Street.

MOULDING FITTINGS.
See Blocks, Moulding.

MOULDINGS, Metallic.

(Mouldings, Fittings.)
APPLETON ELEC. CO., 212 N. Jefferson st., Chicago, Ill., "Pagrip."
CONNECTICUT ELEC. MFG. CO., Connecticut & Florence aves., Bridgeport, Conn.
NATIONAL METAL MOLDING CO., 1107 Fulton Bldg., Pittsburgh, Pa.

MOULDINGS, Wood.

Moulding & Cleats.
CENTRAL LUMBER CO., Chattanooga, Tenn.
American Mfg. Co., Grottoes, Va. (Cleats only).
Benner Mfg. Co., Lancaster, Pa. (Cleats).
Foley Mfg. Co., Chicago, Ill.
Gerry Co., Frederick R., Philadelphia.
Mitchell Moulding Co., Chicago, Ill., "Wire Grip."
Plannett Lumber & Mfg. Co., Laporte, Ind.
Saulpaugh's Sons, J. M., New York.
Sheip Mfg. Co., Henry H., Phila.
Thornton & Co., Holland, Mich.
Wright & Craycroft, Chicago, Ill.

MOULDS.

Castings for Domes, Shades, Stands.
Empire Pattern Wks., Reading, Pa.

MOUTHPIECES, Telephone.

Glass, Antiseptic, Whispering.
Am. El. Co., Chicago (Germless).
Automatic Elec. Co., Chicago, Ill.
Colytt Laboratories, Chicago, Ill., "Clariphone."
Gottschalk Waterproof Sanitary Transmitter Co., New York.
Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y.
Weeks Mfg. Co., F. R., New York, N. Y., "Maxum."

MOVING PICTURE APPARATUS.

FORT WAYNE ELEC. WKS. OF G. E. CO., 1412 Broadway, Fort Wayne, Ind., "Compensarc."
Bausch & Lamb Optical Co., Rochester, N. Y. (Rheostats).
Bell & Howell Co., Chicago, Ill., ("Inductor-Compensator for Arc Lamps).
Cooper Hewitt Elec. Co., Hoboken, N. J.
Edison, Inc., Thos. A., Orange, N. J.
Enterprise Optical Mfg. Co., Chicago, Ill. (Motiograph Projector).
Hallberg, J. H., New York (Economizers).
Motion Picture Fire Prevention Devices Co., Chicago, Ill.
Nicholas Power Co., New York.
Pathescope Co. of America, New York (Cinematograph Projector).
Phantoscope Mfg. Co., Washington, D. C., "Demograph."
Precision Machine Co., New York, "Simplex."
Speed Controller Co., New York (Arc Controllers).
Vindex Elec. Mfg. Co., Aurora, Ill. (Lemon Arc Regulator).

MUFFLERS, Telephone.

Miniature Tele. Booth Co., New York.
Smith Selling & Advertising Co., Philadelphia, Pa., "Flack."

NAIL INSULATING WASHERS
See Washers, Leather.
NAILS, RUBBER HEAD.
See Staples and Tacks.

NAME PLATES.

GRAMMES & SONS, L. F., Allentown, Pa.

NETS & GUARDS,

MORSE, FRANK W., Boston, Mass.

NIPPLES—See Fittings, Conduit.
NITROGEN HOLDERS.
See Shells, Chandelier.
NITROGEN LAMPS.
See Lamps, Inc., Nitrogen.
NOVELTIES.—See Toys.

NUMBERS, Automobile.

(Electrically Illuminated.)
Badger Brass Mfg. Co., Kenosha, Wis., "Solar."
Combination Tail Light Co., Boston.
Malton Specialty Co., Boston, Mass. (Battery Tail Lights).
Stafford Lamp and Number Co., Chicago, Ill.
Weber Illuminated Sign Co., Reading, Pa.

NUMBERS House.

(Electrically Illuminated.)
CROUSE-HINDS CO., Syracuse, N. Y.
DONGAN ELEC. MFG. CO., 745 Franklin st., Detroit, Mich.

NURSE SIGNALS.
See Signals, Hospital.
NURSERY MILK WARMERS.
See Heaters, Liquid.
NUT LOCKS. See Fittings, Conduit.
OHMMETERS.
See Instruments, Testing.
OIL ENGINES—See Engines, Gas.
OIL FUSE BOXES.
See Boxes, Manhole.
OIL FUSE CUT-OUTS.
See Cut-Outs, Oil Fuse.
OIL LAMP ADAPTERS.
See Burners, Oil Lamp.
OIL PURIFIERS—See Purifiers, Oil.

OPENERS & LOCKS, Door.

EDWARDS & CO., New York, N. Y., "Emco," "Nojar."
MANHATTAN ELECTRICAL SUPPLY CO., 17 Park pl., New York.
SCHNEIDER, JOHN S., Ridgefield, Conn.
STANDARD LOCK CO., 111-113 Himrod st., Brooklyn, N. Y. ("Champion" Rim and Mortise Opener).
Clark, F. Warren, Dorchester, Mass. ("P. & T." Electric Lock).
Keil & Sons, Francis, New York.
Mueller, M., Boston, Mass., "Reliance," "Reliance, Jr."

OVENS, COOKING.—See Cooking.

OVENS, Drying, Electric.

Annealing.
Bacteriological.
Enameling.
Limb Baking.
Mould Baking.
Temper Drawing.
Vulcanizing.
Laboratory.

INTERNATIONAL ELEC. CO., Century Bldg., Indianapolis, Ind.
Chicago (Ill.) Surgical & Elec'l Co. (Laboratory).
Despatch Mfg. Co., Minneapolis, Minn., Annealing, Enameling, Limb Baking, Mould Baking, Temper Drawing, Vulcanizing.
Elmer & Amend, New York. "Freas" Laboratory Incubator.
Hanovia Chemical & Mfg. Co., Newark, N. J. (Laboratory).
International Instrument Co., Cambridge, Mass., Drying Ovens for Laboratories.
S. W. Elec. Co., New York.
Sargent & Co., E. H., Chicago, Ill.
Thermo Elec. Instrument Co., Newark, N. J. (Laboratory).

OPERATION INDICATORS.
See Indicators, Operation.
ORCHESTRA LIGHTS.
See Portables.
ORE SEPARATORS.
See Separators, Magnetic.
ORGAN BLOWERS.
See Blowers, Organ.
OSCILLATORS.—See Fan Motors; also Deflectors.
OSCILLOGRAPHS.
See Instruments, Testing.
OUTFITS, AUTOMOBILE LTG. & STARTING. — See Systems, Auto.
OUTFITS, FARM LIGHTING.
See Plants, Lighting.
OUTLET BOX HANGERS.
See Hangers, Fixture and Box.
OUTLET BOXES.
See Boxes, Conduit.

OZONIZERS.

FEDERAL SIGN SYSTEM (ELEC.), Lake & Desplaines sts., Chicago, Ill.
GENERAL ELECTRIC CO., Schenectady, N. Y.
SPRAGUE ELEC. WKS. OF GEN. ELEC. CO., 527 W. 34th st., New York, N. Y.
WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa.
Birtman Electric Co., Chicago, Ill., "American."
Electric Ozonizer Mfg. Co., Los Angeles.
Goldberg Ozone Mach. Co., Indianapolis.
Held Company, Chicago, Ill.
Ozone Pure Airifier Co., Chicago, Ill.

PACKING, Steam.

NEW YORK INSULATED WIRE CO., 114 Liberty st., New York, N. Y., "Lightning Non-Tubular."

PADS, COMMUTATOR.
See Compounds, Commutator.

PADS, Heating.

Pads, Caps and Blankets.
AMERICAN ELECTRICAL HEATER CO., Detroit, Mich. ("American Beauty").
GENERAL ELECTRIC CO., Schenectady, N. Y.
LINCOLN ELEC. HTG. APPLIANCES, LTD., 112 W. Adams st., Chicago, Ill., "El Dorado."
NATIONAL ELECTRIC CO., 149 W. Austin ave., Chicago, Ill. ("Hold-Heat" Pads and Blankets).
PHELPS MFG. CO., 265 Jefferson st., Detroit, Mich.
"Flexo" Heating Pads.
WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa.
Economy Elec. Mfg. Co., San Francisco, Cal.
Hot Point Elec. Htg. Co., Ontario, Cal., "El Comfo" Heating Pads.
Johns-Manville Co., H. W., New York, "J-M" Electrotherm Heating Pads, Blankets and Caps.
Jupiter El. Products Co., Cleveland, "Pillowetta."
Landers, Frary & Clark, New Britain, Conn., "Universal."
P. & B. Mfg. Co., Milwaukee, Wis., "Sun Ray."
Pelouze Mfg. Co., Chicago, Ill.
Radio Elec. Co., New York, N. Y.
Reliance El. Htg. Co., Columbia, Pa.
Shaler Co., C. A., Waupun, Wis.
Simplex Electric Heating Co., Cambridgeport, Mass.

PAINTS & COMPOUNDS.

For finishing and saturating wax for insulated wire. See Wax.

FILLING AND SEALING WAX COMPOUNDS.—(For Potheads, Transformers, Batteries, Underground Junction Terminal Boxes, Screw and Bolt Heads).
PAINTS AND VARNISHES.—(Liquid Insulating Paints and Varnishes, for Armatures, Coils, Boxes, etc.).
IMPREGNATING COMPOUNDS.—Compositions, Oil Proof or otherwise, used in Vacuum Machines for Impregatning Armatures, Field Coils, etc.).

CHICAGO MICA CO., Valparaiso, Ind.
"Champion" Paint & Varnish.
CONDENSITE CO. OF AMERICA, Bloomfield, N. J.
Paint and Varnish.
Impregnating Compound.
DOLPH CO., JOHN C., Newark, N. J.
"Chinalak" Clear Varnish.
"Electric" Paint and Varnish.
"Vaculite" Impregnating Compound.
GENERAL BAKELITE CO., 100 William st., New York, N. Y.
Paint and Varnish.
Filling and Sealing Compounds.
INSULATING MATERIALS CO., 805 Wesson ave., Detroit, Mich.
Filling and Sealing Compounds.
McGILL MFG. CO., 39 Oak st., Valparaiso, Ind.
"Crescent Chatterton" Filling and Sealing Compound.
MICA INSULATOR CO., 68 Church, New York, N. Y.
"M. I. C." Compound.
"Nico" Shellac.
"Linolac" Paint and Varnish.
PACKARD ELECTRIC CO., 520 Dana ave., Warren, O.
Impregating Compound.
Paint and Varnish.
STANDARD PAINT CO., Woolworth Bldg., New York, N. Y.
"Flexite" Paint.
"P. & B." Paint and Varnish.
"P. & B." Filling & Sealing.
"P. & B." Impregnating Compound.
STANDARD UNDERGROUND CABLE CO., Pittsburgh, Pa.
"Ozite" Filling & Sealing.
STANDARD VARNISH WKS., New York, N. Y.
"Vultalac," "G. P." Paint and Varnish.
"O. B." Filling & Sealing.
Impregnating Compound.
TROTTER & CO., E. T., 588-594 Johnson ave., Brooklyn, N. Y.
Paint and Varnish.
"Ozokorite" Filling and Sealing.
WALPOLE TIRE & RUBBER CO., Walpole, Mass.
"Armalac," "Enamelac," "Insulac" Paint and Varnish Impregating Compounds.
Alexapope Mfg. Co., Brooklyn, N. Y.
Filling and Sealing Compounds.
Paints and Varnishes.
Ault & Wiborg, Cincinnati, O.
Paint and Varnish.
Benolite Co., Pittsburgh, Pa.
Paint and Varnish.
Berry Bros., Detroit, Mich.
Paint and Varnish.
Brach Supply Co., L. S., Newark, N. J., "Vitolac" Paint and Varnish.
Filling and Sealing Compounds.
Bridgeport Wood Finishing Co., New Milford, Conn.
"Silex" Filling and Sealing.
Calman & Co., Emil, New York.
"Omlac," "Stic-Lac" Paint and Varnish.
Cochran Chemical Co., Jersey City.
Filling and Sealing Compounds.
Paint and Varnish.
Devoe & T. C. Reynolds Co., F. W., New York, N. Y.
Paint and Varnish.
Dielectric Mfg. Co., St. Louis, Mo.
"Dielectros" Paint and Varnish.
"Impregnite" Impreg. Compound.
"Refractite" Filling and Sealing.
Eagle Paint & Varnish Co., Pittsburgh, Pa.
Paint and Varnish.
Flexible Compound Co., Philadelphia.
Flintkote Mfg. Co., New York, N. Y.
"Rex" Paint and Varnish.
Franklin Co., Bound Brook, N. J.
Paint and Varnish.
Graves Co., N. Z., Philadelphia, Pa., Paint & Varnish.
Insulatine Co., New York.
Irvington Varnish & Insulator Co., Irvington, N. J.
Paint and Varnish.
Minerallac Elec. Co., Chicago, Ill.
Filling and Sealing Compound.
Impregnating Compound.
Minwax Co., New York.
Filling and Sealing Compounds.
Mitchell-Rand Mfg. Co., New York.
"B-S." "Electric Black," "Mi-Ra-Lac," "G. M." Asphaltum" Paint and Varnish.
"Leverite" Filling and Sealing Impregnating Compounds.
Mogul Co., New York, N. Y.
Paint and Varnish.
Pruett-Schaffer Chemical Co., Pittsburgh, Pa.
Paint and Varnish.
Schenectady (N. Y.) Varnish Co.
Paint and Varnish.
"Gyite" Filling and Sealing.
Sherwin-Williams Co., Cleveland, O.
"Ajax" Paint and Varnish.
Impregnating Compound.
Standard Asphalt & Rubber Co., Chicago, Ill., "Sarco."
Filling and Sealing Compound.
Sterling Varnish Co., Pittsburgh, Pa.
"Motorlac" Paint and Varnish.
Toch Bros., New York, N. Y.
"R. I. W." Insulectric Paint and Varnish.
Union Clay Products Co., New Brunswick, N. J.
Paint and Varnish.
Voltax Co., New York, N. Y.
Impregnating Compound.
Paint and Varnish.
Wilhelm Co., Reading, Pa.
Paint and Varnish.
Zinsser & Co., Wm., New York.
Filling and Sealing Compounds.

PAINTS, Preservative.

DIXON CRUCIBLE CO., JOSEPH, Jersey City, N. J., "Graphite."
STANDARD PAINT CO., 100 William st., New York, N. Y., "P. & B.," "Flexite."
STANDARD VARNISH WKS., New York, N. Y., "W. P."
Durabla Mfg. Co., New York, N. Y., "Cosmos."

PANELBOARD CABINETS.
See Cabinets, Sheet Steel.
PANELBOARD CABINETS, WOOD
See Cabinets, Wood.
PANELBOARDS. See Switchboards.
PANS, SHOWER.—See Shells.
PAPER, FIBRE.—See Fibre.

PAPER, Insulating.

Paper—Fullerboard—Press Board.
AMERICAN MICA CO., Newton Lower Falls, Mass., "Puritan."
DIAMOND STATE FIBRE CO., Bridgeport, Pa.
STANDARD PAINT CO., Woolworth Bldg., New York, N. Y., "Giant," "P. & B."
WALPOLE TIRE & RUBBER CO., Walpole, Mass., "Neponset."
Carter, Rice & Co., Boston, Mass.
Case Bros., Highland Park, Conn. (Fuller Board).
Case & Risley Press Paper Co., Oneco, Conn. (Fuller Board).
Manning Paper Co., J. A., Troy, N. Y.
Merwin Paper Co., Hartford, Conn. (Fuller Board).
National Fibre & Insulation Co., Yorklyn, Del., "Peerless."
Pittsburg Insulating Co., Pittsburgh.

PAPER SHADES.
See Shades, Fabric.
PAPER SLEEVES.—See Sleeves.
PARAFFINE.—See Wax.
PARERS, VEGETABLE.
See Peelers and Parers.
PASTE, SOLDERING.
See Soldering Compounds.

PATENT ATTORNEYS.

See Page 198

PEARL

Erie Button Works, Erie, Pa.

PEELERS & PARERS,

Vegetable.
(Motor Driven.)
Am. Paring Mch. Co., Phila., Pa. (Parers).
Davis, Crouse Mfg. Co., Chicago, Ill., "Sim-Peel-O."
Imperial Machine Co., New York, N. Y., "Victoria."
Reinhold Mfg. Co., Detroit, Mich., "National." "Standard."

PENCILS, Electricallly Lighted.

HAWTHORNE MFG. CO., 9 Spruce st., Bridgeport, Conn., "Old Sol" Pencil Flashlight.

PENDANT SWITCHES .
See Switches, Pendant.
PERCOLATORS.—See Cooking.

PERFORATING MACHINES.

DAVIDSON MACHINE CO., 508 N. 12th st., Philadelphia, Pa.
American Perforator Co., Chicago.
Asam Bros., Phila., Pa., "Asam-Wright."
Climax Electric Co., Baltimore, Md.
Davidson Machine Co., Phila., Pa.
Kahan Mach. Wks., Chicago, Ill.
Pierce Perforator Co., Springfield, O.

“Better Be a Brooklynite”

More than 40,000 additional horse power in electric motors were added to the service mains of the Brooklyn Edison Company during the past year—an increase of 20 per cent over any preceding year in the Company's history.

Among the enterprises of national reputation who adopted Brooklyn Edison Power during 1914 were the following:

American Manufacturing Company	7,000 H. P.
E. W. Bliss	3,000 H. P.
Austin Nichols & Company	1,000 H. P.
American Tobacco Company	400 H. P.
R. G. Dun	250 H. P.

The low rate for central station power is but one of the attractions which draws to Brooklyn the country's biggest industrial institutions.

BROOKLYN has an unsurpassed improved waterfront of 56 miles, which cost over $200,000,000 for its development.

BROOKLYN has a population of over 1,800,000. Two hundred new residents absorbed daily.

BROOKLYN has more miles of asphalted streets than any other city in America—796 miles paved.

BROOKLYN is the home of 8,000 industrial establishments which pay weekly to their 150,000 employees almost $2,000,000 in salaries. An average of four new manufacturing plants have opened each week during the last five years, making an additional yearly investment of $10,000,000.

Such is Brooklyn, the city of big business

Without obligation on your part, our Industrial Power Bureau will be glad to compile information on labor costs, factory and loft sites, freight charges to and from Brooklyn on raw and manufactured products;—or gather any other facts that would be of value to you should you be considering a change of locality.

This service is yours for the asking, as likewise is our new booklet—“Industrial Brooklyn.”

Edison Electric Illuminating Company of Brooklyn

GENERAL OFFICES 360 PEARL STREET BROOKLYN, N. Y.

PERFUMERS & DISINFECTORS.

Perfumers — Disinfectors—Vaporizers—Deodorizers—Medicators—Fumigators.
GREENWICH SALES CO., 257 Broadway, New York, N. Y., "Vaporel."
Bennett & Brown, Paterson, N. J., "Vapoform."

PERMANENT MAGNETS.
See Magnets, Permanent.

PHANTOM LOAD INSTRUMENTS.
See Instruments, Testing.

PHOSPHOR BRONZE,

Electrical Alloy Co., Morristown, N. J.
Reeves & Son, Paul S., Philadelphia.
Phosphor Bronze Smelting Co., Philadelphia, Pa., "Elephant."
Riverside (N. J.) Metal Co.
Waterbury (Conn.) Mfg. Co.

PHOTO ENGRAVING LAMPS.
See Lamps, Photo Engraving.

PHOTOGRAPHIC LAMPS.
See Lamps, Photo Engraving.

PHOTOMETERS,

(Lamp Testing.)
BIDDLE, JAMES G., 1211 Arch st., Philadelphia, Pa., Importer ("Siemens & Halske").
THOMPSON-LEVERING CO., Philadelphia, Pa., "Peerless."
Foote, Pierson & Co., New York, "Matthews," "Sharp-Millar."
Leeds & Northrup Co., Philadelphia, Pa., "Reichsanstalt," "Macbeth Illuminometer."
Precision Instrument Co., Detroit.
Queen-Gray Co., Philadelphia, Pa.

PHOTO PRINTERS.

Calhoun Photo Materials Co., Muskegon, Mich.
New York Engravers' Supply, N. Y.
Victor Animalograth Co., Davenport, Iowa.

PICK-UPS, Trolley Wire.

Electric Service Supplies Co., Phila., "Garton-Daniels," "St. Louis."
Ohio Brass Co., Mansfield, O.

PICTURE PROJECTORS.
See Toys and Novelties.

PIGTAILS & FLEXIBLE LEADS.

BELDEN MFG. CO., 2308 So. Western ave., Chicago, Ill.
GOLDMARK, JAMES, 83 Warren st., New York, N. Y. (Sole Selling Agent for New England Electrical Works, Lisbon, N. H.).
ROME WIRE CO., Rome, N. Y.
Chapin Co., Charles E., New York.
Salem (Mass.) Electrical Supply Co.

PIKE POLES.—See Tools, Pole.

PILOT HOUSES.
See Balconies, Pole.

PINS, INSULATOR IRON.
See Pole Line Hardware.

PINS & BRACKETS, Wood.

BISSELL CO., F., Toledo, Ohio.
CENTRAL LUMBER CO., Chattanooga, Tenn.
NATIONAL PIN & BRACKET CO., North Vernon, Ind.
PETTINGELL-ANDREWS CO., Atlantic ave.-Pearl st.-Purchase st., Boston, Mass. (O'Neill Reinforced).
SOUTHERN EXCHANGE CO., 97 Warren st., New York, N. Y.
WESTERN LUMBER & POLE CO., Spokane, Wash.
Absher Co., North Wilkesboro, N. C.
American Cross Arm Co., Chicago.
Ball Top Locust Pin & Bracket Co., Charlotte, N. C.
Branchville Pole, Tie & Timber Co., Branchville, S. C.
Buena Vista Hardware Co., Stony Bottom, W. Va.
Call, Clarence, No. Wilkesbarre, N. C.
Cohn & Bock, Princess Anne, Md.
Cottage Planing Mill Co., Everett, Pa.
Elkin Machinery Co., Elkin, N. C.
Georgia Tie & Lumber Co., New York.
Gravely, B. F. & R. P., Martinsville, Pa.
Houston & Leggett, Houston, Tex.
Kapp & Miller, Rural Hall, N. C.
Locust Pin Co., Front Royal, Va.
Marcus & Sons Co., H., Muscoda, Wis.
McGlauflin Mfg. Co., Sunnyvale, Cal.
Monterey (Tenn.) Pin & Bracket Co.
Noblett & Co., E. J., Chattanooga.
Osborne & Son, Camden, N. J.
Petertyl, Victor, Traverse City, Mich.
Pilloid Lumber Co., Swanton, O.
Port Royal (Pa.) Pin Mills.
Texas Arm & Pin Co., Beaumont.
Towers Pin & Bracket Co., Ellijay, Ga.

PIPE BENDERS. — See Benders, Conduit; also Benders, Metal Moulding.

PIPE CUTTERS, HAND.
See Stocks, Dies, etc.

PIPE CUTTING MACHINES.
See Machines, Pipe.

PIPE ENDS.
See Fittings, Conduit.

PIPE HANGERS.
See Hangers and Clamps.

PIPE INSULATORS.
See Insulators, Electrolytic.

PIPE LOCATORS.
See Instruments, Pipe Locating.

PIPE REAMERS.
See Stocks, Dies, Reamers.

PIPE STRAPS.
See Hangers and Clamps.

PITCH KETTLES.—See Pots.

PLANTS AND FLOWERS.
See Decorative Lighting.

PLANTS, Lighting.

Complete Small Lighting Plants—Generating Sets.
AMERICAN BATTERY CO., 1162 Fulton st., Chicago, Ill.
CARLISLE & FINCH CO., 221 E. Clifton ave., Cincinnati, O.
CENTRAL ELEC. CO., Chicago, Ill.
COMMERCIAL ELECTRICAL SUPPLY CO., St. Louis, Mo.
EDISON STORAGE BATTERY CO., 107 Lakeside ave., Orange, N. J.
ELECTRICAL TESTING CO., 352 Knoxville ave., Peoria, Ill.
GENERAL ELECTRIC CO., Schenectady, N. Y.
KOENER STORAGE BATTERY MFG. CO., 2840 Lincoln ave., Chicago, Ill.
MAIN ELEC. MFG. CO., Pittsburgh, Pa.
ROCHESTER MOTORS CO., 686 Lexington ave., Rochester, N. Y., "Service."
STRONG ELECTRIC CO., Des Moines, Iowa.
WESTERN ELECTRIC CO., New York N. Y.
WESTINGHOUSE ELEC. & MFG. CO., East Pittsburgh, Pa., "Peerless."
Alamo Engine & Supply Co., Omaha.
Allis-Chalmers Mfg. Co., Milwaukee.
Alamo Mfg. Co., Hillsdale, Mich.
Armstrong Mfg. Co., Waterloo, Ia.
Barber-Dwinell Elec. & Mfg. Co., Kansas City, Mo.
Bruston Ltg. & Pumping System, New York.
Cushman Motor Wks., Lincoln, Neb.
Dayton (Ohio) Elec'l Mfg. Co.
Detroit (Mich.) Engine Works.
Detroit Motor Car Supply Co., Detroit, Mich.
Fairbanks, Morse & Co., Chicago, Ill.
Fay & Bowen Eng. Co., Geneva, N. Y.
Fort Wayne (Ind.) Engineering & Mfg. Co., "Paul."
Garford Mfg. Co., Elyria, O., "Homelite."
Gasoline Engine Equipment Co., N. Y.
Globe Electric Co., Milwaukee, Wis.
Gray Electric Co., Springfield, O., "Ruralite."
Heer Engine Co., Portsmouth, O.
Ideal Ltg. Co., Davenport, Ia.
Incandescent Light & Stove Co., Cincinnati, O., "F-P."
Jones Co., L. B., Kansas City, Mo.
Kise Electric Co., Peoria, Ill.
Lauson-Lawton Co., De Pere, Wis.
Lunt Moss Co., Boston, Mass.
McGraw Co., Sioux City, Ia.
Mac Rae, Hector, Baltimore, Md.
Matthews Boat Co., Port Clinton, O.
Miller & Reed, Clay Center, Kans., "Dalite."
Moon Mfg. Co., Chicago, Ill.
New Britain Machine Co., New Britain, Conn. ("Case" Lighting Outfits).
Nicholas Power Co., Stamford, Conn.
Nichols & Wright Motor Co., Buffalo, N. Y.
Okey Mfg. Co., Columbus, O.
Parker, C. W., Leavenworth, Kans. (Portable).
Regal Gasoline Engine Co., Coldwater, Mich.
Remington Oil Engine Co., N. Y.
Richardson Eng. & Mfg. Co., Hartford, Conn.
Rumely Products Co., Laporte, Ind.
Russell Co., E. L., Indianapolis, Ind., "Silent Valve."
Schug Elec. Mfg. Co., Detroit, Mich.
Silvey Electric Co., Dayton, O.
Strelinger Co., Chas. A., Detroit ("Brush" Lighting System).
Sturtevant Co., R. F., Hyde Park, Mass. (Gasoline-Electric).
Suburban Ltg. & Gas Eng. Co., Toledo, O.
United Mfg. Co., Kansas City, Mo. ("Peerless"), (Portable Power Plant).
United Pump & Power Co., Milwaukee, Wis.
Warner Lamp Co., Davenport, Ia.
Western Utilities Co., Milwaukee.
Waterman Motor Co., Detroit, Mich.
Wood & Spencer Engineering Co., Cleveland, O.

PLATE WARMERS.
See Cooking Utensils.

PLATES, Flush Switch.

Brass-Steel-Glass.
CONNECTICUT ELEC. MFG. CO., Connecticut and Florence aves., Bridgeport, Conn. (Brass).
CONNECTICUT TELE. & ELEC. CO., Meriden, Conn.
HART & HEGEMAN MFG. CO., Hartford, Conn.
KEIL & SON, FRANCIS, New York, N. Y. (Steel).
LOVELL & CO., F. H., Arlington, N. J., "Double Eagle."
METROPOLITAN ELEC. MFG. CO., 14th st. and East ave., Long Island City, N. Y.
PERKINS ELEC. SWITCH MFG. CO., Bridgeport, Conn.
UNION ELECTRIC CO., Trenton, N. J.
Exel Plating & Mfg. Co., Cleveland.
Federal Elec. Co., Pittsburgh, Pa.
United States Glass Co., Pittsburgh, Pa. (Glass).

PLATES, NAME—See Name Plates.

PLATES, SHOWER.—See Shells.

PLATFORMS, Pole.

Platforms—Balconies—Seats—Houses.
BISSELL CO., F. Toledo, O.
HUBBARD & CO., Pittsburgh, Pa.
LANZ & SONS, M., Pittsburgh, Pa.
OSHKOSH MFG. CO., Oshkosh, Wis.
Anderson Forge & Mach Co., Detroit, Mich.
Cook, F. B., Chicago, Ill. (Houses).
Hallett Iron Works, Harvey, Ill.
Meekel, Fred. L., Chicago, Ill.
North Penn Iron Co., Philadelphia.

PLATING DYNAMOS.
See Generators. Electro-Plating.

PLATINUM.

BAKER & CO., INC., Newark, N. J.
Am. Platinum Works, Newark, N. J.
Bishop & Co., J., Malvern, Pa.
Commercial-Research Co., Long Island City, N. Y. (Welded).
Goldsmith Bros. Smelting & Refining Co., Chicago, Ill.
Platt, C. S., New York, N. Y.
Roessler & Hasslacher Chemical Co., New York, N. Y.
Schawel & Co., Jas., New York.
Schneider, Inc., Emile, Newark, N. J.
Wilson Co., H. A., Newark, N. J.

PLIERS, Wire Cutting.

PORTER, H. K., 6 Ashland st., Everett, Mass., "Boston."
Billings & Spencer Co., Hartford, Ct.
Bohner Mfg. Co., C. E., Champaign, Ill., "Victor."
Cincinnati (O.) Tool Co., "Hargrave."
Crescent Tool Co., Jamestown, N. Y.
Cronk & Carrier Mfg. Co., Elmira, N. Y.
Erie Tool Co., Erie, Pa.
Johns-Manville Co., H. W., New York (Insulated Handles).
Klein & Sons, Mathias, Chicago, "Goehst," "Goodridge."
Kraeuter & Co., Newark, N. J.
Montgomery & Co., New York (Imp.).
Osborne & Co., C. S., Harrison, N. J.
Peck, Stow & Wilcox Co., Southington, Conn. (Mica Handle Pliers).
Penn, Inc., A. C., New York (Imp.).
Reed Mfg. Co., Erie, Pa.
Scholhorn Co., Wm., New Haven, Conn., "Bernard's."
Schuchardt & Schutte, New York (Imp. "Linstrom," "S. & S.").
Smith & Hemenway Co., New York, N. Y., "Red Devil."
Utica (N. Y.) Drop Forge & Tool Co.
Vom Cleff Co., New York (Imp. of Frye's Patent Splicing Pliers).
Wiebusch & Hilger, Ltd., New York 'Import "Challenge").

PLUG CUT-OUTS—See Cut-Outs.

PLUG PULLERS.—See Tongs.

PLUG TONGS—See Tongs, Carbon.

PLUGS, EXPANSION.
See Bolts, Expansion.

PLUGS & RECEPTACLES, Battery Charging.

CONDIT ELECTRICAL MFG. CO., Boston, Mass.
GENERAL ELECTRIC CO., Schenectady, N. Y.
STANLEY & PATTERSON, 23 Murray st., New York, N. Y.
WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa.
Anderson Mfg. Co., Albert & J. M., Boston, Mass., "A. B. C."
Russell & Stoll Co., New York, N. Y.

PLUGS & RECEPTACLES, Flush.

BRYANT ELECTRIC CO., Bridgeport, Conn.
CENTRAL ELEC CO., Chicago, Ill., "Ralco."
CHELTEN ELECTRIC CO., Philadelphia, Pa., "D. D." and "Chapman."
COLGAN, WM. H., West Newton, Mass.
CUTTER CO., Philadelphia, Pa.
GENERAL ELECTRIC CO., Schenectady, N. Y.
HART MFG. CO., Hartford, Conn., "Diamond H."
HART & HEGEMAN MFG. CO., Hartford, Conn., "H. & H."
HUBBELL, HARVEY, Bridgeport, Conn. (Indicating Receptacles).
MANHATTAN ELECTRICAL SUPPLY CO., 17 Park pl., New York, "Mesco."
METROPOLITAN ELECTRIC MFG. CO., 14th st. and East ave., Long Island City, N. Y.
PAISTE CO., H. T. (Hart & Hegeman Mfg. Co., Hartford, Conn., Exclusive Selling Agents).
PERKINS ELECTRIC SWITCH MFG. CO., Bridgeport, Conn.
STANLEY & PATTERSON, 23 Murray st., New York, N. Y.
STEEL CITY ELEC. CO., 1207 Columbus ave., Pittsburgh, Pa., "Campbell."
TRUMBULL ELECTRIC MFG. CO., Plainville, Conn.
UNION ELECTRIC CO., Trenton, N. J.
Arrow Electric Co., Hartford, Conn.
Pringle Elec. Mfg. Co., Philadelphia.
Standard Electric & Elevator Co., Baltimore, Md. (Polyphase).

PLUGS & RECEPTACLES, Stage & Machine Tool.

ADAM ELECTRIC CO., FRANK, St. Louis, Mo.
BRYANT ELECTRIC CO., Bridgeport, Conn.
CONDIT ELECTRICAL MFG. CO., Boston, Mass., "Cushing."
CUTTER CO., GEORGE, 411 Notre Dame st., South Bend, Ind.
DETROIT FUSE & MFG. CO., 1411 Rivard st., Detroit, Mich. (Machine Tools).
GENERAL ELECTRIC CO., Schenectady, N. Y. (Double Ended Receptacle).
KUTSCH, L. W., 1839 N. Fairfield ave., Chicago, Ill.
MANHATTAN ELECTRICAL SUPPLY CO., 17 Park pl., New York, N. Y., "Mesco" Connector).
SPRAGUE ELEC. WKS. OF G. E. CO., 527 W. 34th st., New York, N. Y.
STANLEY & PATTERSON, 23 Murray st., New York, N. Y., "Fielding."
TREGONING ELECTRIC MFG. CO., 416 W. Prospect st., Cleveland, O.
WESTERN ELECTRIC CO., New York, N. Y., "Kreuger."
A. G. Ele. & Mfg. Co., Seattle, Wash.
Chicago Elec. Mfg. Co., Chicago, Ill. ("Handy" Stage Connector).
Electric Apparatus Co., Chicago, Ill.
Elevator Supply & Repair Co., Chicago, "Hagen's."
Russell & Stoll Co., New York.
United Elec. Sales Co., New Orleans.
Universal Elec. Stage Ltg. Co., New York, "Kliegl."

PLUGS, Attachment.

BENJAMIN ELECTRIC MFG. CO., 120 So. Sangamon st., Chicago, Ill.
BEST ELECTRIC CO., Pittsburgh, Pa.
BRYANT ELECTRIC CO., Bridgeport, Conn.
CUTLER-HAMMER MFG. CO., Milwaukee, Wis.
CONNECTICUT ELECTRIC MFG. CO., Connecticut and Florence aves., Bridgeport, Conn.
FREEMAN ELECTRIC CO., E. H., Trenton, N. J.
GENERAL ELECTRIC CO., Schenectady, N. Y.
HUBBELL, HARVEY, Bridgeport, Ct.
MANHATTAN ELECTRICAL SUPPLY CO., 17 Park pl., New York, N. Y., "Mesco."
PAISTE CO., H. T. (Hart & Hegeman Mfg. Co., Hartford Conn., Exclusive Selling Agents).
PASS & SEYMOUR, Solvay, N. Y.
PERU ELECTRIC CO., Peru, Ind.
PHELPS MFG. CO., Detroit, Mich.
TREGONING ELECTRIC MFG. CO., 416 W. Prospect st., Cleveland, O., "Anti-Knot."
TRUMBULL ELECTRIC MFG. CO., Plainville, Conn.
UNION ELECTRIC CO., Trenton, N. J.
YOST ELEC. MFG. CO., Toledo, O., "Lock Fast."
Arrow Electric Co., Hartford, Conn., "Arroplug."
Novelty Elec. Co., Philadelphia, Pa., "Fibre."
Solar Elec. Co., Chicago, "B. & S."

PLUGS, Conduit.

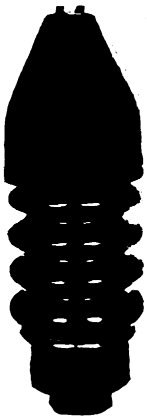
Wood and Iron.
American Wood Working Co., Chicago, Ill. (Wood).
Philadelphia Elec. & Mfg. Co., Philadelphia, Pa. (Iron).
Wolf & Co., J. C., Westville, N. J. (Wood).

PLUGS, Fuse.

BRYANT ELECTRIC CO., Bridgeport, Conn., "Pyrolite."
CHICAGO FUSE MFG. CO., Chicago, Ill.
CONNECTICUT ELECTRIC MFG. CO., Connecticut and Florence aves., Bridgeport, Conn.
DAUM CO., A. F., Pittsburgh, Pa. (Renewable).
D. & W. FUSE CO., Providence.
GENERAL ELECTRIC CO., Schenectady, N. Y.
PAISTE CO., H. T. (Hart & Hegeman Mfg. Co., Hartford, Conn., Exclusive Selling Agents), "Fasette."
PERKINS ELECTRIC SWITCH MFG. CO., Bridgeport, Conn.
UNION ELECTRIC CO., Trenton, N. J.
WEBER ELECTRIC CO. (Henry D. Sears, General Sales Agent, 131 State st., Boston, Mass.).
Arrow Elec. Co., Hartford, Conn.
Balassa, C. C., New York ("Six-in-One" Safety Fuse Plug).

SAFETY PLUS EFFICIENCY,
FOR THE GOOD OF THE SERVICE.

"FRANKLIN" POT-HEADS



Thoroughly Reliable Inexpensive
Easily Installed

The "Franklin" is the ideal Pot-head for joining high voltage, lead-covered cables to overhead or station lines, without jeopardizing continuity of service.

In the "Franklin" provision is made for clamping the lead cable sheath between two rotating members, so designed as to produce a water-tight joint. This simple and effective feature eliminates the expensive wiped connection.

Another important feature is the *Static Bell* for carrying the metal sheath gradually away from the insulating material of the cable, thereby dissipating all abnormal static stresses, which are bound to occur at this point. This connection allows the compound to fill all the space between the cable and its lead sheath and prevents the danger of interposition of a film of air at the point where the cable leaves the sheath. The entire absence of metal in the covers of "Franklin" Pot-heads is another construction feature which eliminates all excessive strains at the point of entrance and helps to make these Pot-heads undeniably the safest and best on the market.

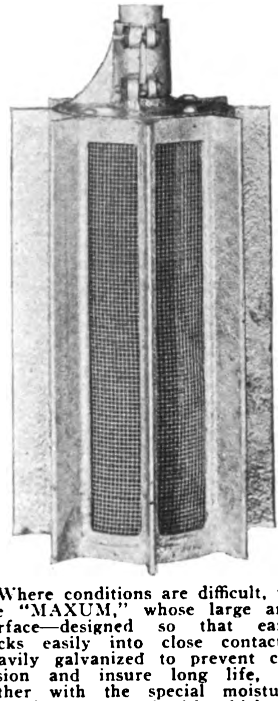
Investigate—"FRANKLIN" Pot-heads will prove their value.
A complete line—a design for every need.

REVERSE PHASE RELAYS

A Phase Reversal Means a Motor Reversal

and ten to one, that means an accident. Any man in the stress of hasty repairs may hook up an elevator, conveyor or crane motor, reversed. And when you throw the starting switch, its totally unexpected reversed action may cause a terrible accident. Our Reverse Phase Relays render such accidents impossible, preventing danger to life and limb as well as damage to machinery. The cost of the Relay is trifling—the cost of accidents, heavy.

"MAXUM" GROUNDING BOX



Where conditions are difficult, try the "MAXUM," whose large area surface—designed so that earth packs easily into close contact—heavily galvanized to prevent corrosion and insure long life, together with the special moisture-attracting compound with which the box is filled; all work to insure a good ground in poor soil, even in dry weather.

"FRANKLIN" AIR PRESSURE RELAY

Protection to Transformer Service

is assured by the "Franklin" without any personal element, for as soon as the air pressure drops below a safe point, the alarm circuit is closed through the relay and the bell is sounded, which effectually warns the operator, since it is unusual. The cost of this device is insignificant when compared to the continuity of service, which might be interrupted by an overheated transformer.

"FRANKLIN" INSTRUMENT CUT-OUT SWITCHES

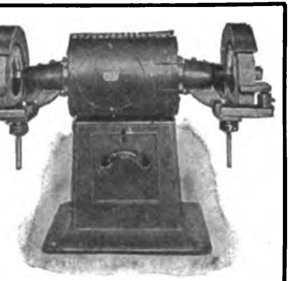
Safe Meter Testing

on the secondaries of current transformers is assured with the "Franklin" Switch, since a closed secondary circuit is maintained in all positions. Your equipment and your men are protected against the danger of leaving the current secondary open with the primary alive. Current transformer explosions cannot occur through careless meter testers or operators where "Franklin" Test Switches are used.

They are strong, foolproof and of ample capacity.

PHILADELPHIA ELECTRIC COMPANY SUPPLY DEPT.

132 SOUTH ELEVENTH STREET PHILADELPHIA



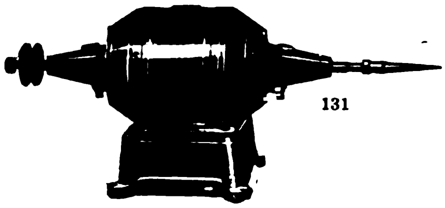
ROTHMOTORS

For Electric Polishing and Grinding

On these machines the distance from the centre of the shaft to the front of the machine is very small enabling the user to work on long pieces with the flat face of the wheel. Thus wear is prevented because it is not necessary to grind and polish with the corners of the wheel, as is the case where the motor body is larger than the wheels and does not allow the work to face the wheels properly. These machines alone have this feature of large working radius.

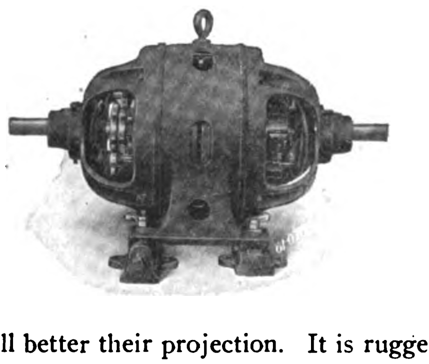
ROTH BROS. & CO.

1396 W. Adams St. CHICAGO, ILL.



Motion Picture Theatres are good prospects for the—

The Wagner WHITE LIGHT Converter



It will better their projection. It is rugged and reliable. It is efficient. It is a good proposition for any dealer or contractor to sell.

Write to-day for descriptive literature and prices.

Wagner Electric Manufacturing Company, St. Louis, Mo.

Johns-Manville Co., H. W., New York, N. Y., "Noark."
Premier Elec'l Mfg. Co., Bridgeport, Conn. (Indicating).
Trenton Elec. & Conduit Co., Trenton, N. J.

PLUGS, Spark.

WESTERN ELEC. CO., New York, N. Y., "Pittsfield."
Albright Ignition Co., Columbus, Ga.
American Coil Co., Foxboro, Mass.
Auburn (N. Y.) Ignition Mfg. Co.
Belvidere (Ill.) Screw & Machine Co.
Benford Mfg. Co., E. M., Mt. Vernon, N. Y.
Benton, L. F., Vergennes, Vt.
Best Ignition Equipment Co., New York, N. Y.
Bigsbee Mfg. Co., Cleveland, O., "Vital."
Bobra Spark Plug Co., Dayton, O.
Bosch Magneto Co., New York.
Brown Co., Syracuse, N. Y.
Champion Ignition Co., Flint, Mich.
Delta Mfg. Co., Newark, N. J.
Champion Spark Plug Co., Toledo, O.
Dow Mfg. Co., Braintree, Mass.
Doxey, N. D., Elmira, N. Y., "Lightning."
Eisemann Magneto Co., New York.
Faust Co., H. C., Philadelphia, Pa., "Panther."
Frontier Specialty Co., Buffalo, N. Y., "All-in-One."
Fulton Co., Milwaukee, Wis., "Eklips."
Grossman Co., Emile, Brooklyn, N. Y., "Red Head."
Hagstrom Bros. Mfg. Co., Lindsborg, Kan.
Hampshire Mfg. Co., Hatfield, Mass., "Wizard."
Hartford (Conn.) Machine Screw Co.
Heinze Elec. Co., Lowell, Mass.
Herz & Co., New York.
Ideal Switch Co., Plainville, Conn.
Jeffery Dewitt Co., Detroit, Mich., "Reliance," "J. D." "Edison."
Johns-Manville Co., H. W., New York, "Metzger."
Kalbfell & Co., C. J., Chicago.
Knobloch-Heideman Mfg. Co., South Bend, Ind., "Quick Action."
Kokomo (Ind.) El. Co., "Kingston."
Legnard Bros., Waukegan, Ill.
Lemke Elec. Co., Milwaukee, Wis.
Lockwood-Ash Motor Co., Jackson, Mich.
Long Bros., Kokomo, Ind.
Long Distance Spark Plug Co., Indianapolis, Ind.
MacGregor Co., John, Boston, Mass., "Viking."
Milwaukee Auto Specialty Co., Milwaukee, Wis., "Center Fire."
Mosler & Co., A. R., Mt. Vernon, N. Y., "Spit Fire," "Triumph," "Beat-Em-All," "Vesuvius."
Motor Accessories Mfg. Co., Marshalltown, Ia., "Hel-fie."
New York Mica & Mfg. Co., Auburn, N. Y., "Wright."
Oakes & Dow Co., Boston, Mass., "Comet." "Sootless."
Pasha Spark Plug Co., Blomfield, N. J.
Porter & Co., W. S., Chicago, Ill.
Power & Efficiency Co., Trenton, N. J., "Peco."
Rajah Auto Supply Co., Bloomfield, N. J.
Randall-Falchney Co., Boston, Mass., "Mac-Kae Blitz."
Reflex Ignition Co., Cleveland, O., "Arrow," "Lightning."
Rex Ignition Co., New York.
Samson Elec. Co., Canton, Mass., "Perfex."
Sharp Spark Plug Co., Cleveland, O.
Silvex Co., New York, N. Y.
Simplex Auto Specialty Co., Detroit.
Splitdorf Elec. Co., Newark, N. J.
Standard Co., Torrington, Conn., "Black Eagle."
Star Specialty Mfg. Co., Chicago, Ill.
Sturdy Mfg. Co., Chicago, Ill., "Sta-Rite."
Superior Motor Specialty Co., Philadelphia, "Su-Ton," "Su-Dig."
Toledo Spark Plug Mfg. Co., Toledo, O., "Peerless."
Volcano Spark Plug Co., Ashland, O.
V-Ray Co., Marshalltown, Ia.
Williams, E. Q., Syracuse, N. Y.
Witherbee Igniter Co., Springfield, Mass., "Wico."

PNEUMATIC BRUSHES.
See Brushes, Pneumatic.

POCKET METERS.
See Instruments, Pocket.

POLARITY CHANGERS.
See Changers, Polarity.

POLARITY INDICATORS.
See Instruments, Indicating.

POLE LINE HARDWARE.

Arms—Brackets—Pins.

BARNES & KOBERT MFG. CO., Milldale, Conn.
BRADY ELECTRIC MFG. CO., New Britain, Conn.
CUTTER CO., GEO., 411 Notre Dame st., South Bend, Ind., "Economy."
ELECTRIC RAILWAY EQUIPMENT CO., Cincinnati, Ohio.
GENERAL ELECTRIC CO., Schenectady, N. Y.
HUBBARD & CO., Pittsburgh, Pa. ("Peirce" and "Bo-Arm" Insulator Brackets & "Hi-Ten" Cross Arms).
LANZ & SONS, M., Pittsburgh, Pa.
MORRIS, ELMER P., 136 Liberty st., New York.
ST. LOUIS MALLEABLE CASTING CO., 7777 N. Conduit ave., St. Louis, Mo., "Way."
THOMAS & SONS CO., R., East Liverpool, O., "Byllesby" Wishbone Cross Arm, "Lee" Iron Pins.

Arthur Bros., Manchester, N. H. (Adjustable Break Arms).
Bates Expanded Steel Truss Co., Chicago, Ill.
Creaghead Engineering Co., Cincinnati ("Flexible" Trolley Bracket).
Diamond Steel Pole Co., Phila., Pa.
Dunton & Field, Cambridge, Mass. (Insulator Bracket).
Electric Service Supplies Co., Philadelphia, Pa. ("Keystone" Insulator Transmission Pin).
Electrical Construction Supply Co., Springfield, O., "Chubbuck."
Electrical Engineers' Equipment Co., Chicago, Ill.
Fletcher Mfg. Co., Dayton, O.
Hall, Frank B., Newton Falls, O. (Pressed Steel Bracket).
Hallett Iron Works, Harvey, Ill.
Illinois Malleable Iron Co., Chicago.
Line Material Co., So. Milwaukee, Wis., "Kyle," "Hendee," "Ajax."
Lundin Elec. & Mch. Co., Boston.
Mott Iron Works, J. L., New York, N. Y. (Arc Lamp Brackets).
Naugatuck Malleable Iron Wks., Naugatuck, Conn., "Beardsley."
Norton, W. T., West Park, O.
Ohio Brass Co., Mansfield, O.
Oliver Iron & Steel Co., Pittsburgh.
Specialty Device Co., Cincinnati, O. (Iron Cross Arms).

POLE MEASURING INSTRUMENTS.—See Instruments, Pole.

POLES, Barbers (Revolving)

Atwater Mfg. Co., Waukegan, Ill., "Cyclo."
Kochs Co., Theo. A., Chicago, Ill.
Koken Barbers' Supply Co., St. Louis.

POLES, Concrete & Cement.

AMERICAN STEEL & WIRE CO., Chicago, Ill. (Triangle Mesh Reinforcement).

American Concrete Pole Co., Richmond, Ind.
Arrow Engineering Co., St. Louis, Mo.
Chicago Concrete Pole Co., Chicago.
Great Lakes Dredge & Dock Co., Cleveland, O. (Concrete Poles).
Nat'l Reinforced Concrete Pole, Pile & Pipe Co., Denver, Colo.
New York Pole Co., New York (Reconstructing Tubular Iron Poles).
Pettijohn Co., Terre Haute, Ind. (Columns).
Pittsburgh Reinforcing Pole Co., Pittsburgh, Pa. ("Orr's" Wooden Pole Reinforcement).

POLES, Iron and Steel.

Line Construction, Not Ornamental.

ELECTRIC RAILWAY EQUIPMENT CO., Cincinnati, O. ("Elreco," "Wire-Lock")
HUBBARD & CO., Pittsburgh, Pa., "Presteel."
MORRIS, ELMER P., 136 Liberty st., New York.

American Bridge Co., New York, N. Y., "Shiffler."
Bates Expanded Steel Truss Co., Chicago, Ill.
Blow Steel Const. Co., Pittsburgh, Pa., "Triplex."
Carbo Steel Post Co., Chicago, Ill.
Diamond Steel Pole Co., Philadelphia, Pa. (Tapered).
Franklin Steel Co., Franklin, Pa., "Tripartite."
National Tube Co., Pittsburgh, Pa.
Sectional Steel Pole Co., Minneapolis, Minn. (Sectional).

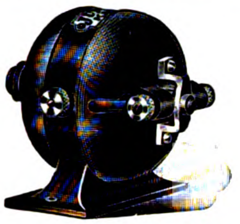
POLES, Trolley.

From car to trolley wire.

National Tube Co., Pittsburgh, Pa.
Nuttall Co., Pittsburgh, Pa.
Pittsburgh Trolley Pole Forge Co., Pittsburgh, Pa.

POLES, Wood.

ABELES & TAUSSIG, St. Louis, Mo.
ATLANTIC CREOSOTING & WOOD PRESERVING WORKS, Norfolk, Va.
BISSELL CO., F., Toledo, O.
CHAPIN CO., E. T., 505 Columbia Bldg., Spokane, Wash.
CRAWFORD CEDAR CO., Menominee, Mich.
DIAMOND POLE & PILING CO., 716 Ludington st., Escanaba, Mich.
FOWLER CO., JOHN H., Fisher Bldg., Chicago, Ill.
GRUNINGER, F. F., 431 So. Dearborn st., Chicago, Ill.
KAYE & CARTER LUMBER CO., 802 Lumber Exc. Bldg., Minneapolis, Minn.
LARSON BROS. LUMBER CO., 736 Security Bldg., Minneapolis, Minn.
LINDSLEY BROS. CO., Spokane, Wash.
MAC GILLIS & GIBBS CO., 1302 Wells Bldg., Milwaukee, Wis.
MERCEREAU-HAWKIN TIE CO., Robson-Prichard bldg., Huntington, W. Va.
MORRISON LUMBER CO., J. W., 927 Lumber Exc., Minneapolis Minn.
MOSS TIE CO., T. J., Security Bldg., St. Louis, Mo.
NATIONAL POLE CO., Spokane, Wash.
NAUGLE POLE & TIE CO., 5 So. Wabash ave., Chicago, Ill.



K. & D. MOTORS

Battery motors and small generators our specialty.

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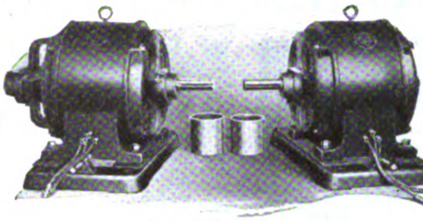

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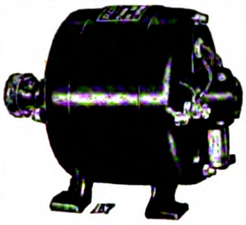

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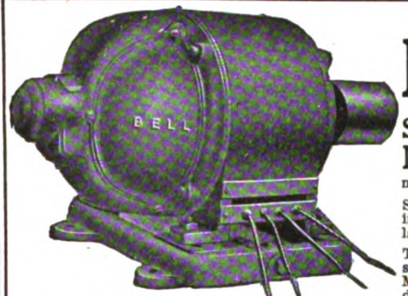

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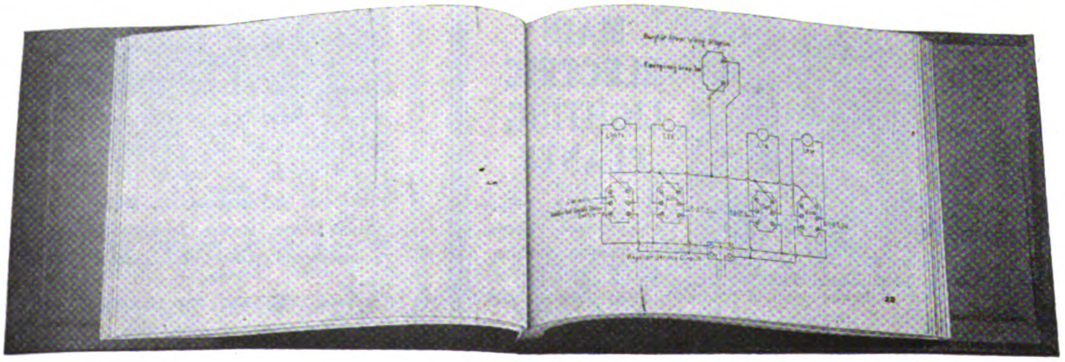

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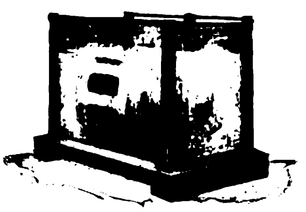

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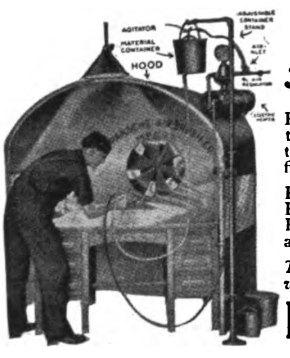

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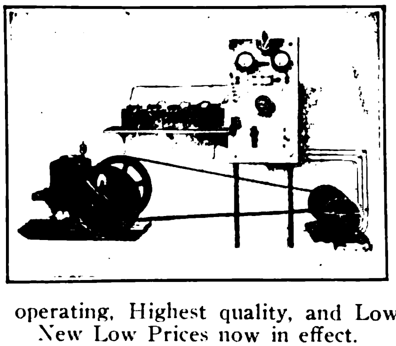

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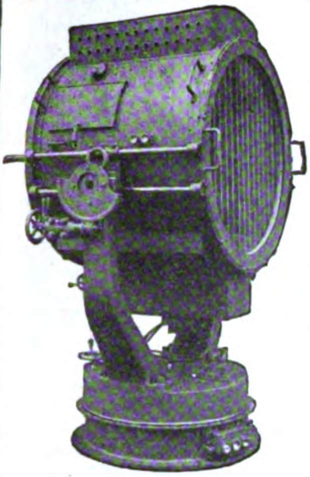

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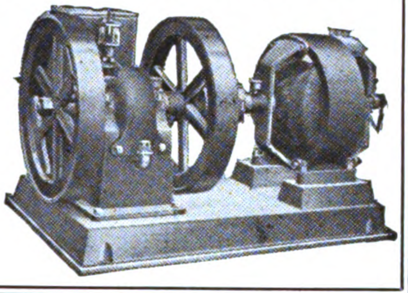

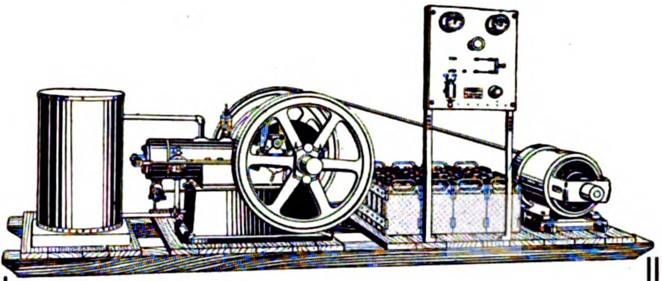

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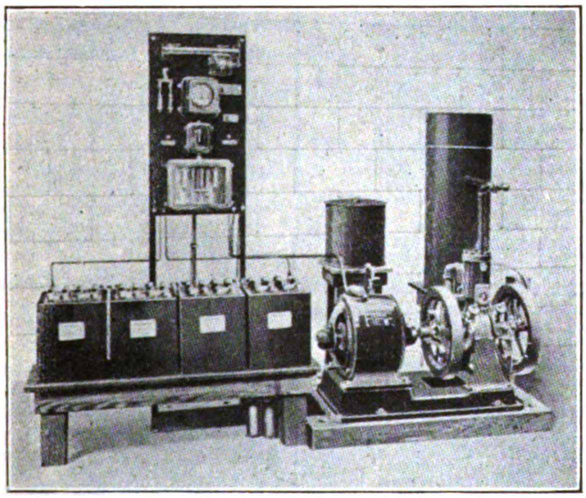

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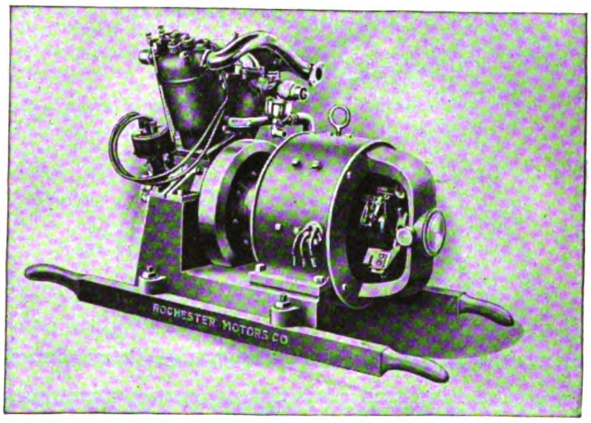

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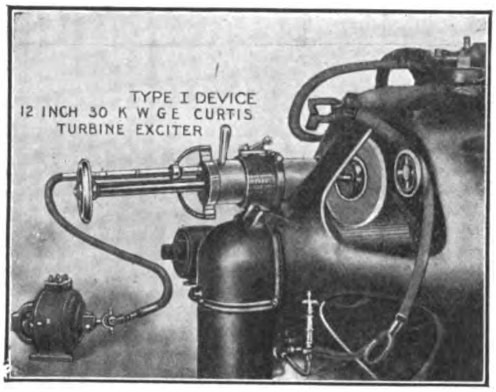

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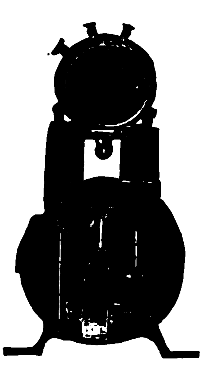

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Pierce Elec. Co., Tampa, Fla. (Desk Light).
Pittsburgh Architects Bronze Works, Pittsburgh, Pa., "Berger Bronze."
Plaza Mfg. Co., New York, N. Y. (Wood Fibre).
Portland Co., Portland, Me.
Port Royal (Pa.) Pin Mill.
Rainaud Co., Meriden, Conn.
Reed Ware Mfg. Co., Chicago, Ill.
Rockford Light Furniture Co., Rockford, Ill. (Wood).
Rose Bros. & Co., Lancaster, Pa. ("India" Collapsible Lamp).
Runzel-Lenz Elec. Mfg. Co., Chicago, Ill. ("Comfort" Desk Light).
Rush Bros., Chicago, Ill.
Skelley Bracket Co., Cleveland, O. ("Ray" Desk Light).
Spiro Mfg. Co., C., New York, "Brite-Lite" Floor Portable.
Stavenhagen Co., W. H., New York.
Stillman-Paine Co., Milwaukee, Wis. (Composition).
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Straus & Son, L., New York (Cut Glass).
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Sunlight Reflector Co., B'klyn, N. Y.
Turchin Co., New York, "Duro-Glaze."
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Unique Art Glass & Metal Co., Brooklyn, N. Y.
U. S. Art Glass Co., Hartford, Ct.
Wall, Leo J., Toledo, O. (Desk Light).
Wallace Novelty Co., New York.
White Co., H. C., No. Bennington, Vt. ("Radion" Desk Lamp).
Wappler Elec. Mfg. Co., New York.
Waud Mfg. Co., New York (Wood).
Weidlich Bros. Mfg. Co., Bridgeport, Conn.
Weintraub Brass Mfg. Co., N. Y.
Wells Light Co., Jersey City, N. J., "Wallworks."
Whaley & Co., J. A., New York.
Wheeler Reflector Co., Boston, Mass.
Wilkinson Co., Brooklyn, N. Y.
Will & Baumer Co., Syracuse, N. Y.
Williamson Co., L. A., New York, "Flexlyte."
Wizard Elec. Lamp Co., San Francisco, Cal., "D'Light."
Wolff Co., Wm. F., New York ("Anywheare" Desk Light).
Ypsilanti Reed Furniture Co., Ionia, Mich.

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Fahnestock Elec. Co., Brooklyn, N. Y. (Spring).
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Hartford (Conn.) Machine Screw Co.
Harvard Electric Co., Chicago, Ill.
Int'n'l Brass & Elec. Co., N. Y.
Int'n'l Elec. Co., Indianapolis, Ind.
National-Acme Mfg. Co., Cleveland.
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Standard Mfg. Co., Bridgeport, Conn., "Crown."
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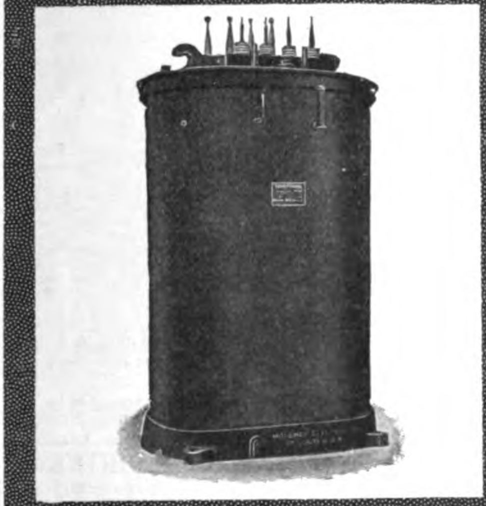

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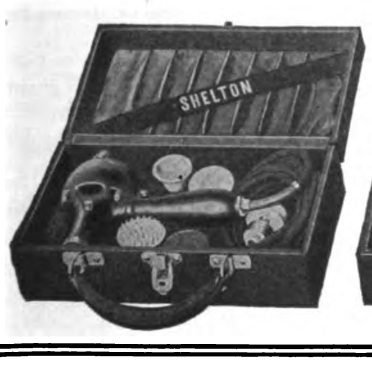

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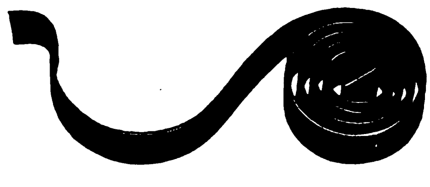

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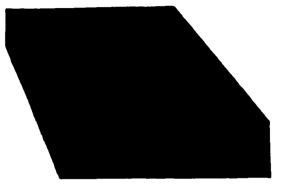

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POWER TABLES.
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PREPAYMENT METERS.
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PRESSURE REGULATING SWITCHES. — See Switches, Pressure.

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See Attachments, Socket.

PULLERS, FUSE PLUG.
See Tongs.

PULLERS, Rod, Ground.

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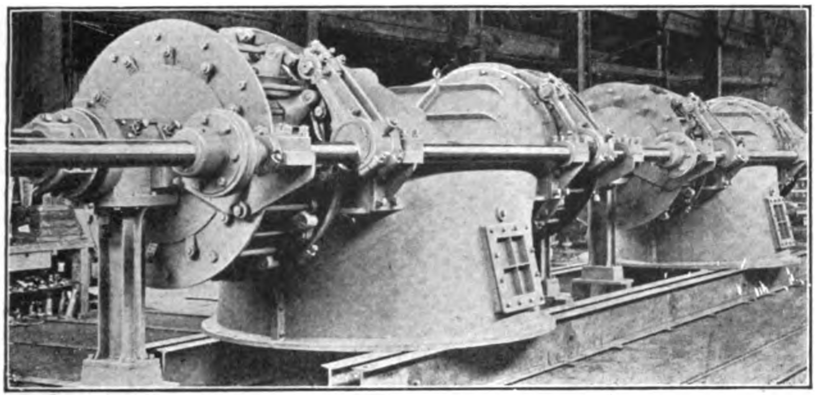

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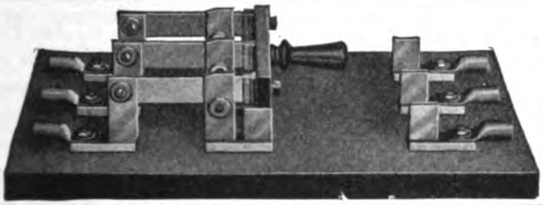

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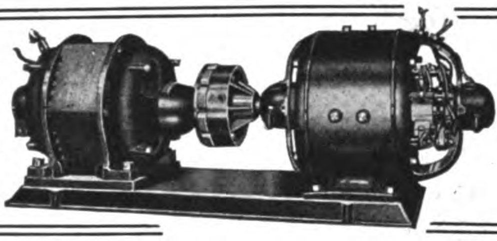

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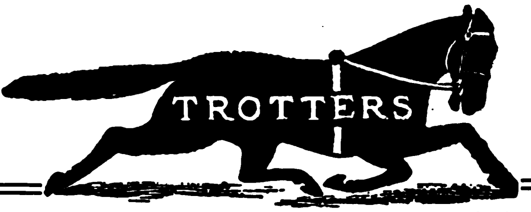

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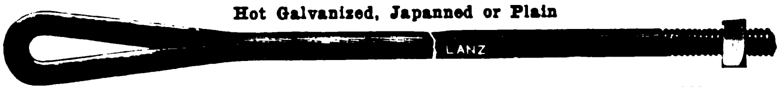

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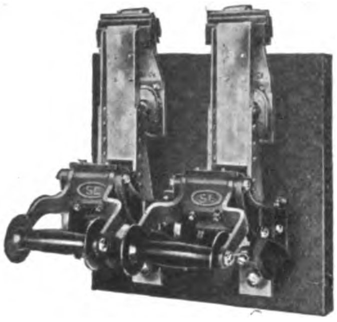

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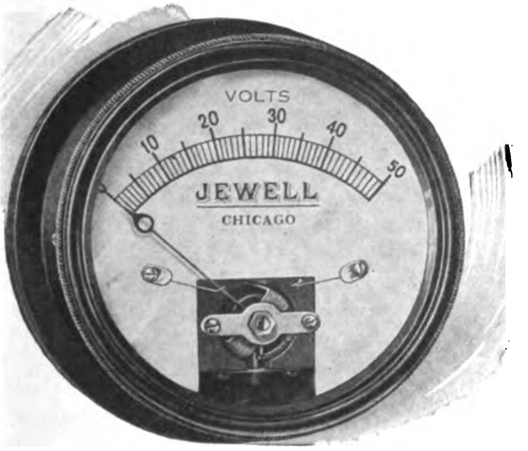
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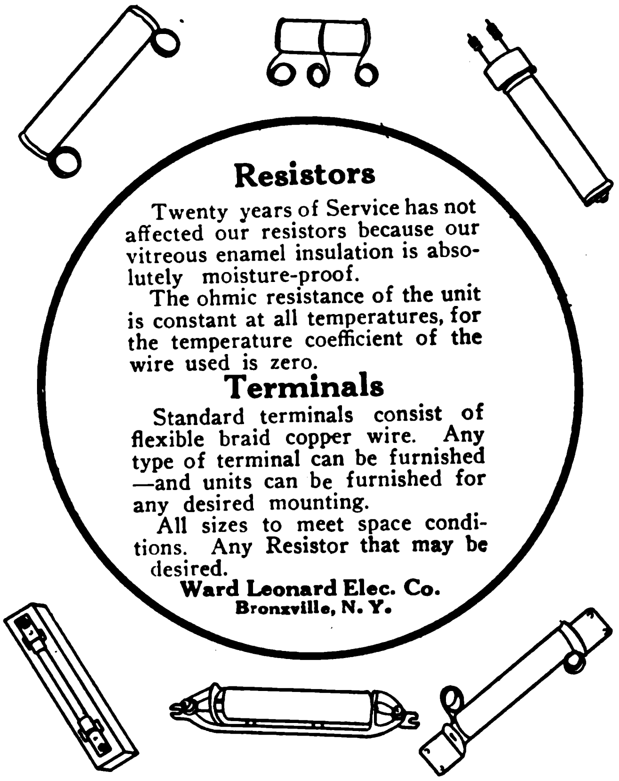
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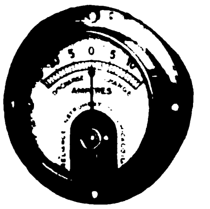
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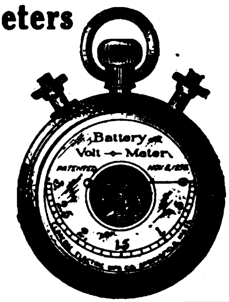

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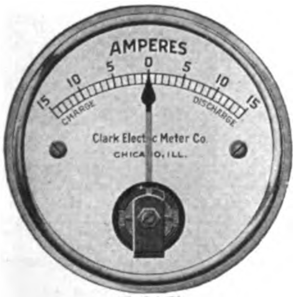
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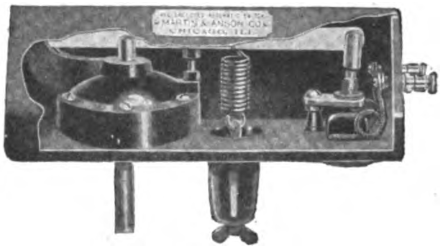
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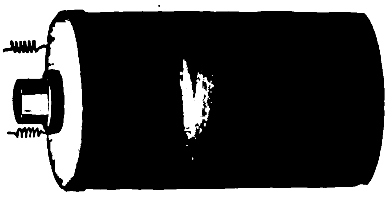

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See Burners, Oil Lamp.
READING LAMPS—See Portables.
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See Plugs and Receptacles.
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See Sockets, Regulating.

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See Pages 200-201

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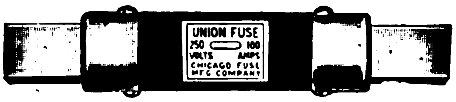

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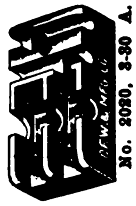

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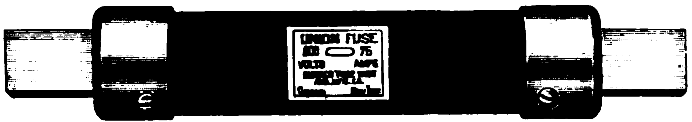

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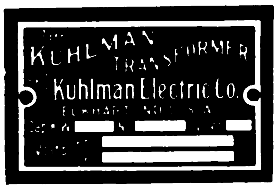

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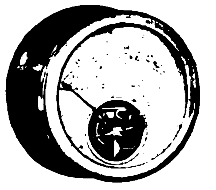

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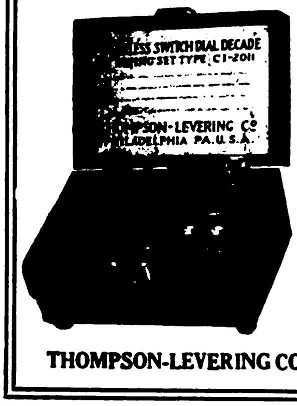

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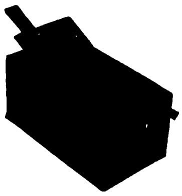

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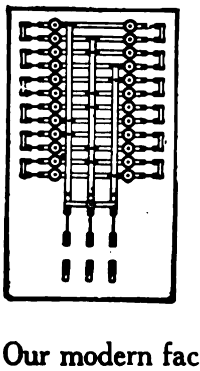

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See Pullers, Rod Ground.

RODS, ANCHOR.
See Anchors, Guy.

RODS.—See Units, Rods & Grids.

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ROTARY CONVERTERS.
See Motor-Generators.

RUBBER, Hard.

Hard Rubber—Ebonite—Vulcanite.

BOONTON RUBBER CO., Boonton, N. J.

Amn. Hard Rubber Co., New York.
Diamond Rubber Co., Akron, O.
Essex Ruber Co., Trenton, N. J.
Luzerne Rubber Co., Trenton, N. J.
Stokes Rubber Co., J., Trenton, N. J.
Vulcanized Rubber Co., New York.

RUBBER GLOVES.—See Gloves.

RUGS, FOOT WARMING.
See Warmers, Foot.

RUHMKORFF COILS.
See Electro Therapeutical Apparatus.

SAD IRONS, HANDLES.
See Handles, Wood.

SAD IRON HOLDERS.
See Holders, Sad Iron.

SAD IRONS.—See Irons, Sad.

SAL AMMONIAC.—See Chemicals.

SALTS.—See Soldering Compounds.

SAMOVARS. See Cooking Utensils.

SAMPLE BOARDS.
See Advertising Devices.

SCARFPINS.—See Toys.

SCRAPERS, Wire.

Dicke Tool Co., Downers Grove, Ill., "Perry."
Elec. Tool Co., Chicago, "P. & G."
Klein & Sons, Mathias, Chicago, Ill., "Goehst."

SCREW DRIVERS.

Insulated Handles. Ratchet.

BENJAMIN ELECTRIC MFG. CO., 120 So. Sangamon st., Chicago, Ill.

Advance Mfg. Co., Pittsburgh, Pa., "Heinz."
Buffalo Specialty Co., Buffalo, N. Y. (Leather Handle).
Cincinnati Tool Co., Cincinnati, O., "Hargrave."
Disston & Sons, Henry, Philadelphia.
Ducharmes & Co., Shelburne Falls, Mass.
North Bros. Mfg. Co., Philadelphia, Pa. ("Yankee" Ratchet).
Starrett Co., L. S., Athol, Mass. (Pocket).

SCREW DRIVERS, MOTOR DRIVEN.—See Tools, Portable Hand.

SCREW Machine Products.

BARNES CO., WALLACE, South and Wallace sts., Bristol, Conn.
CLARK NOVELTY CO., Rochester, N. Y.

DUNBAR BROS. CO., Bristol, Conn.

Allen Mfg. Co., Hartford, Conn.
Chicago Nut Co., Chicago, Ill.
Chicago Screw Co., Chicago, Ill.
Cornwall & Patterson Mfg. Co., Bridgeport, Conn.
Eastern Machine Screw Corp., New Haven, Conn.
Hartford (Conn.) Mach. Screw Co.
Hill Co., Geo. Q., Boston, Mass.
National-Acme Mfg. Co., Cleveland.
New Haven (Conn.) Mach. Screw Co.
Osborn & Stephenson, Plainville, Conn.
Peck & Young Mfg. Co., Forestville, Conn.
Pittsburgh (Pa.) Screw & Bolt Co.
St. Louis Screw Co., St. Louis, Mo.
Universal Machine Screw Co., Hartford, Conn.

SCREWS, Machine.

BLAKE & JOHNSON CO., Waterbury, Conn.
HUBBELL, INC., HARVEY, Bridgeport, Conn.

American Screw Co., Providence, R. I.
Atlantic Mfg. Co., Bridgeport, Conn.
Atlas Bolt & Screw Co., Cleveland, O.
Chicago Screw Co., Chicago, Ill.
Corbin Screw Corp., New Britain, Ct.
Eastern Machine Screw Corp., New Haven, Conn.
General Mfg. Co., Waterbury, Conn.
Hanson Bros., Plainville, Conn.
Hartford (Conn.) Machine Screw Co.
Keystone Screw Co., Philadelphia, Pa.
Miles Co., F. S., Philadelphia, Pa.
National Acme Mfg. Co., Cleveland, O.
National Sewing Machine Co., Belvidere, Ill.
Niles-Bement-Pond Co., New York.
Progressive Mfg. Co., Torrington, Ct.
Standard Screw Products Co., Detroit, Mich.
Worcester Machine Screw Co., Worcester, Mass.

SCRUBBERS.
See Cleaners and Polishers.

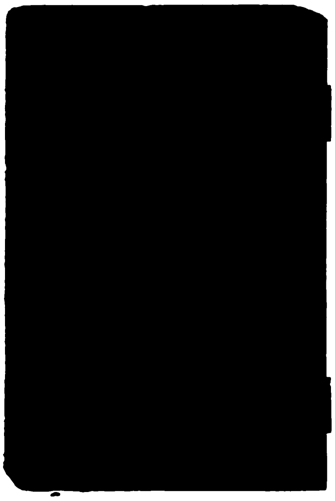
SEALING WAX.—See Paints and Compounds; also Wax.

SEALS, Meter.

(For Sealing Elec. Meters.)

GENERAL ELECTRIC CO., Schenectady, N. Y.

All Steel Electrically Welded CUT-OUT BOXES



Not a rivet in them. Strong, true to standard—heavily coated with high grade protective enamel paint.

Unless otherwise specified, we furnish standard 7-8 inch diameter knock-outs for 1-2 inch conduit pipes.

Special order boxes have one set of knock-outs (alike in each box) for loom, federal bushings or conduit pipes, at no extra charge. It's better to send sketch with order for any special boxes, but we carry an extensive stock of ordinarily required types.

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Chicago **SOUTH BEND, IND.** New York

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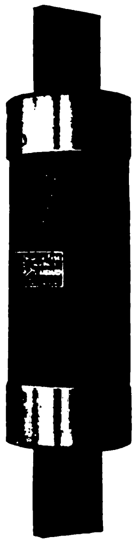

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The Fuses
That Really Protect.

For Over Twenty Years the Standard.

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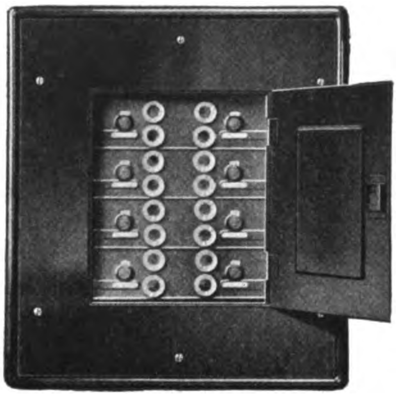
GUTTERED CABINETS
for Regular Plug and Panel Cutouts
and Dead Front Perkins Panel Cutouts



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Electrical Manufacturers BALTIMORE, MD.

The next time a fuse blows, replace it with an
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Circuit Breaker
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United Seal Co., Columbus, O., "Peerless," "Safety."
Security Seal Co., Pittsburgh, Pa.

SEARCH LIGHTS .
See Projectors, Electric.
SEATS.—See Platforms.
SECHOMETERS.
See Instruments, Testing.

SECOND HAND APPARATUS.

See Pages 200-201

SEGMENTS.—See Discs, Armature; also Bars, Commutator.

SEPARATORS, Magnetic.

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American Grondal Co., New York.
American Zinc Ore Separating Co., Denver, Colo.
Buchanan Co., C. G., New York.
Ding Electro-Magnetic Separator Co., Milwaukee, Wis.
Magnetic Separator Co., Troy, N. Y.
Oakes Co., Roland, Holyoke, Mass.
Wetherill Separating Co., New York.

SERVICE BOXES. — See Boxes, Cast Iron; also Cabinets, Sheet Steel.
SERVICE SWITCHES.
See Switches, Combination.
SETS, GENERATING.
See Plants, Lighting.
SETS, TESTING.—See Instruments, Testing.
SHADE CLEANERS.
See Cleaners, Globe and Shade.
SHADE HOLDERS.
See Holders, Shade.
SHADES, ARC LAMP.
See Shades, Metallic.

SHADES, Asbestos.

ASBESTO-GLEAM MFG. CO., 846 S. Canal st., Chicago, Ill., "Daylight Way."

SHADES, Fabric.

Silk, Paper and Celluloid.
Bloch & Co., L. D., New York (Paper).
Century Equipt. Co., New York, "Glassine" linen & transparent paper shades.
Cleveland-Akron Sign Co., Cleveland, O. (Paper).
Dallmer Mfg. Co., T. C., Chicago, Ill. (Wire Forms).
Fixture Specialty Co., Los Angeles.
Frank Mfg. Co., I. A., Minneapolis.
Gudeman & Co., New York (Silk and Cretonne Shades and Domes).
Lynch Co., George C., N. Y. (Silk).
Storrs Mica Co., Owego, N. Y.
Straus-Hohenstein Co., N. Y. (Silk).
Unique Art Glass & Metal Co., Brooklyn, N. Y. (Silk).
Utility Shade Co., Tenafly, N. J. (Celluloid Silk and Paper).
Waldo Co., New York (Silk).
Whaley & Co., J. A., New York, N. Y. (Silk and Paper).
Will & Baumer Co., New York, N. Y.

SHADES, Glass.

Glassware. Globes.
Bowls. Hemispheres.
Balls. Reflectors.

CONSOLIDATED LAMP & GLASS CO., Coraopolis, Pa., "Cora," "Aurora," "Pastelle," "Rosedore."
GILL BROS. CO., 225 Parian Bldg., Steubenville, O., "Parian."
GLEASON TIEBOUT GLASS CO., 71 W. 23d st., New York, N. Y., "Camia," "Polycase," "Carrara," "Ivory" "Intaglio," "Beaux Arts," "Florentine," "Albedoglas," "Blanco."
KIRCHBERGER & CO., M., 378 2d ave., New York, N. Y. (Importers).
LENSED ELECTRIC SHADE CO., 101 Warren st., New York, N. Y., "Gilbert," "Nubolux."
MACBETH-EVANS GLASS CO., Pittsburgh, Pa., "Alba," "Mazalite" and "Invalux," "Decora."
NATIONAL X-RAY REFLECTOR CO., 233 Jackson blvd., Chicago, Ill., "X-Ray," "Poke Bonnet," "Helmet," "I-Comfort," "Scoop," "Midget."
PITTSBURGH LAMP, BRASS & GLASS CO., Pittsburgh, Pa., "Havana," "Delica White," "Translox," "Pilabrasgo."
SCHAFFER CO., MAX, 26 Warren st., New York (Imp.), "Ferlux."
SIEGMAN & WEIL, 18 E. 27th st., New York, N. Y. (Imp.).

Bayley & Sons, Brooklyn, N. Y., "Equalite."
Bergen Co., J. D., Meriden, Conn. (Cut Glass).
Bournique Glass Co., Kokomo, Ind., "Morlite."
Cambridge Glass Co., Cambridge, O.
Canton Glass Co., Marion, Ind.
Corning (N. Y.) Glass Co.
Eagle Glass & Mfg. Co., Wellsburg, W. Va.
Elkins Glass Co., Monaca, Pa., "Ray-Do," "Krakno," "Vesta."
Euler & Co., New York (Imp.).
Fensterer & Ruhe, New York (Imp.).
Friedlaender, Oscar O., New York (Importer), "Fredro."
Gill & Co., Philadelphia, Pa.
Gillinder & Sons., Phila., Pa., "Nemalite," "Persian," "Mellilite," "Nebulite."
Harter Mfg. Co., Chicago, Ill., "Adlite," "Reflectolier."
Haskins Glass Co., Martins Ferry, O., "Lucida," "Psyche."
Holophane Wks. of G. E. Co., Cleveland, O., "Fostoria," "Xtraficiency," "Veluria," "Pyro," "Callo," "Sudan," "Clearcut," "Panelex," "Druid," "Trutint."
Imperial Glass Co., Bellaire, O., "Nuart."
Jefferson Glass Co., Follansbee, W. Va., "Doric."
Lighting Studios Co., New York, N. Y. (Import "Superlux").
McFaddin & Co., H. G., New York, N. Y., "Emeralite," "Opalite."
Morgan & Sons, John, New York, "Snowflake."
Mound Valley Glass Mfg. Co., Mound Valley, Kan.
Noe & Sons, Wm. R., New York, N. Y. (Importer).
Northwood Co., H., Wheeling, W. Va., "Luna."
Opalux Co., New York, N. Y., "Camia," "Carrara," "Gletieco."
Pennsylvania Glass & Mfg. Co., Pietsburgh, Pa.
Phoenix Glass Co., New York, "Pheno," "Marbo," "Phenixlite."
Plant & Co., New York, "Berylite."
Quezal Art Glass & Decorating Co., Brooklyn, N. Y.
Ripley & Co., Connellsville, Pa.
Steuben Glass Wks., Corning, N. Y., "Calcite," "Aurene."
Tarentum (Pa.) Glass Co., "Tara."
United States Glass Co., Pittsburgh, Pa., "Chatham," "Lenox," "Colonial.".
Wellington Glass Co., Cumberland, Md.
Williamsburgh Flint Glass Co., Brooklyn, N. Y.
Wyllie China Co., Huntington, W. Va.

SHADES, Leaded, Mosaic or Stamped Brass.

MACBETH-EVANS GLASS CO., Pittsburgh, Pa., "Bourbonic," "Iridile."

Amboy Works, New York, N. Y.
Am. Art Glass Co., Camden, N. J.
American Art Glass Co., New York.
Art Glass Mfg. Co., New York.
Art Shade Co., Chicago, Ill.
Braunstein Bros. Co., New York.
Bent Glass Novelty Co., New York.
Clinton Metal Lamp Co., New York.
Colonial Art Glass Co., Chicago, Ill.
Daggett & Curry Co., Waltham, Mass.
Doric Art Glass Co., Minneapolis.
Grand Art Glass Novelty Co., New York.
Handel Co., Meriden, Conn.
Harchmann Art Glass Co., Milwaukee.
Ideal Ant. Bent Glass Co., New York.
Imperial Art Glass & Lamp Wks., New York, N. Y.
Int'n'l Shade Co., Springfield, Mass.
Kramer Bros. & Co., New York.
Lehm, Wm., Chicago, Ill.
MacDonald, Donald N., Boston, Mass.
Metallic Mfg. Co., Chicago, Ill.
Mosaic Shade Co., Chicago, Ill.
Mutual Lamp Mfg. Co., New York.
Neuhauser, O. L., Chicago, Ill.
Northwestern Art Shade Co., Chicago.
Novelty Art Glass Co., Pittsburgh, Pa.
Novelty Art, Glass & Shade Co., Cleveland, O.
Opalescent Bent Glass Co., New York.
Rainaud Co., Meriden, Conn.
Royal Art Glass Co., New York, N. Y.
Salem Bros., New York, N. Y.
Standard Art Glass Co., New York.
Stavenhagen Co., W. H., New York.
Tiffany Studios, New York, N. Y.
Ursem Shade Co., L. J., Cleveland, O.
Unique Art Glass & Metal Co., Brooklyn, N. Y., "Imperial."
U. S. Art Glass Co., Hartford, Conn.
Whaley & Co., J. A., New York.
Western Art Glass Shade Works, San Francisco, Cal.

SHADES, Metallic.

A-A ELEC. MFG. CO., Bridgeport, Ct.
BENJAMIN ELECTRIC MFG. CO., 120 So. Sangamon st., Chicago, Ill.
CENTRAL ELEC. CO., Chicago, Ill., "Maxolite."
CUTTER CO., GEO., 411 Notre Dame st., South Bend, Ind.
FARIES MFG. CO., 1036 E. Grand ave., Decatur, Ill.
FEDERAL SIGN SYSTEM (ELEC.), Lake & Desplaines sts., Chicago, Ill. (Porcelain Enameled Shades).
HERWIG ART SHADE & LAMP CO., 2140 N. Halstead st., Chicago, Ill.
HUBBELL, HARVEY, Bridgeport, Ct.
MORSE, FRANK W., Boston, Mass., "Ideal."
OSTRANDER & CO., W. R., 22 Dey st., New York, N. Y.
PEERLESS LIGHT CO., Peerless Bldg., Chicago, Ill.
PLUMB & ATWOOD MFG. CO., Waterbury, Conn., "Plumwood."
WOOD ELEC., C. D., 136 Liberty st., New York, N. Y., "Prima."

American Reflecter & Ltg. Co., Chicago, Ill. ("Paragon" Tungsten Window Reflector).

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"Just Press a Button"

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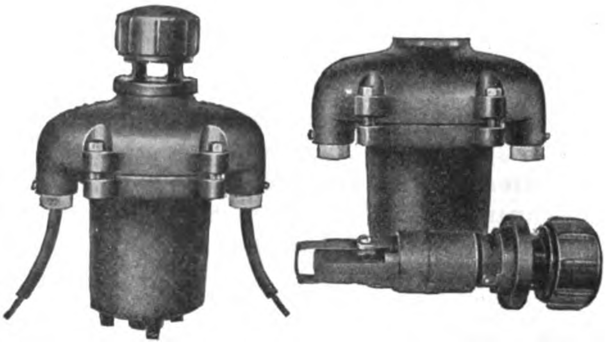

have been subjected to most exhaustive tests under abnormally exacting conditions of a large generator capacity and low power factor and their service records have proven their efficiency. Every Central Station interested in reliable inexpensive high tension protective devices should investigate the "D & W" Oil Fuse Cutouts at once. Write *now* for Circular No. 100.

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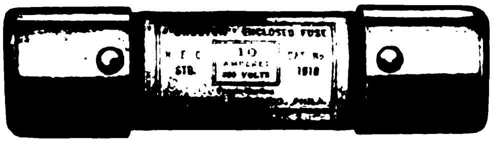

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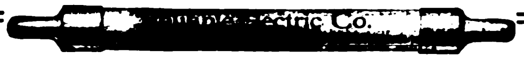

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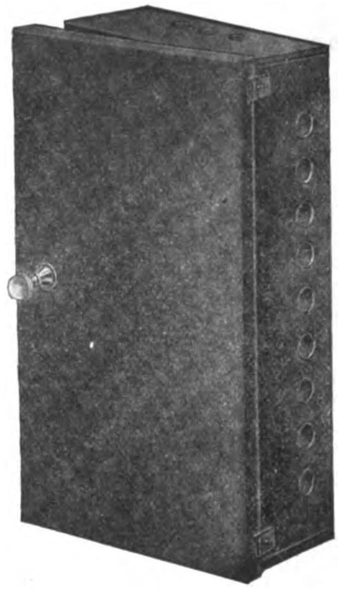

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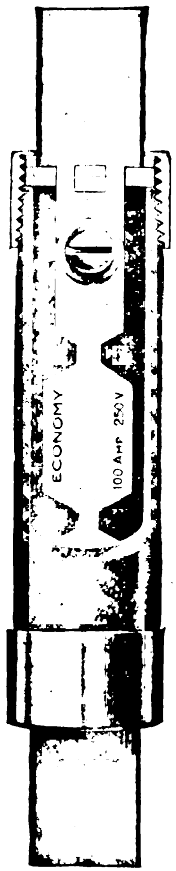

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DuPlex Shade Co., Buffalo, N. Y.
Enamel Products Co., Cleveland, O.
Gail-Webb Mfg. Co., Buffalo, N. Y.
Goldstein, J., New York, N. Y.
Harter Mfg. Co., Chicago, Ill.
Holophane Wks. of G. E. Co., Cleveland, O., "Holophane-D'lier."
Johns-Manville Co., H. W., New York.
Klemm & Co., Philadelphia, Pa.
National Metal Stamping & Mfg. Co., Newark, N. J.
Overbagh & Ayres Mfg. Co., Chicago, Ill., "Oamco."
Phila. El. & Mfg. Co., Phila., Pa.
Royal Enameling & Mfg. Co., Chicago, Ill. (Porcelain Enameled).
Vogel & Bros., W., Brooklyn, N. Y.
Weeks, Nelson, Brooklyn, N. Y.
Western Reflector Co., Chicago.
Wheeler Reflector Co., Boston, Mass., "Para-Steel."

SHADES, Mirror.

NATIONAL X-RAY REFLECTOR CO., 233 W. Jackson blvd., Chicago, Ill., "Visor."
REYNOLDS ELECTRIC CO., 422 S. Talman ave., Chicago, Ill.

American Reflector & Lighting Co., Chicago, Ill., "Paragon."
Bailey Reflector Co., Pittsburgh, Pa.
Johns-Manville Co., H. W., New York, N. Y., "Frink."
Klemm & Co., Philadelphia, Pa., "Diamond."
Overbagh & Ayres Mfg. Co., Chicago, Ill., "Oamco."
Pittsburgh (Pa.) Reflector & Illuminating Co.
Sunlight Reflector Co., B'klyn, N. Y.
Weeks, Nelson, Brooklyn, N. Y.
Western Reflector Co., Chicago, Ill.
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Chicago (Ill.) Flexible Shaft Co.
Coates Clipper Mfg. Co., Worcester.
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Stow Flexible Shaft Co., Phila., Pa.
Stow Mfg. Co., Binghamton, N. Y.
Strand & Co., N. A., Chicago, Ill.
Webb Mfg. Co., Newark, N. J.

SHAVING MIRRORS.
See Mirrors, Shaving.

SHAVING MUGS.
See Heaters, Liquid.

SHELLS, Chandelier.

Metal Spinning.
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EAST SIDE METAL SPINNING CO., 451 Greenwich st., New York.
FRIEDLEY-VOSHARDT CO., 733 So. Halsted st., Chicago, Ill., "Doric" Fixture Parts.
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GRAMMES & SONS, L. F., Allentown, Pa.
PLUME & ATWOOD MFG. CO., Waterbury, Conn.
VIRDEN MFG. CO., 6011 Longfellow ave., Cleveland, O. (Pendants).
WHITE MFG. CO., J. H., 111 N. Third st., Brooklyn, N. Y.

Acme Metal Goods Mfg. Co., N. Y.
American Pin Co., Waterbury, Conn.
Andresen Co., Jacob, Minneapolis.
Art Metal Mfg. Co., Cleveland, O., "Vitr-O-Lite."
Auto City Metal Spinning & Mfg. Co., Detroit, Mich.
Blake Mfg. Co., W. M., Detroit.
Bridgeport (Conn.) Brass Co.
Consolidated Metal Wks., New York.
Crescent Brass Mfg. Co., Cleveland, O., "Show-Pen."
Ehrlich, H., Brooklyn, N. Y.
Ireland & Mathews Mfg. Co., Detroit.
Kinney & Levan, Cleveland, O.
Lincoln Brass & Plating Wks., Chicago, Ill.
Manhattan Brass Co., New York.
Marshfield Lamp & Brass Mfg. Co., Chicago, Ill.
Nat'l Metal Spinning & Stpg. Co., New York.
Perwien, Max, St. Paul, Minn.
Reliance Metal Spinning Co., New York, N. Y.
Rome (N. Y.) Brass & Copper Co.
Schaefer Brass & Mfg. Co., St. Louis.
Scoville Mfg. Co., Waterbury, Conn.
Standard Brass & Bronze Mfg. Co., Pittsburgh, Pa.
Standard Metal Spinning Co., New York, N. Y.
Steele & Johnson, Waterbury, Conn.
Unique Findings & Supply Co., Providence, R. I.
United Metal Spinning Co., New York.
Universal Metal Spinning Co., New York, N. Y.
Vester & Sons, A., Providence, R. I.
Vogel & Bros., W., Brooklyn, N. Y.
Wakefield Brass Co., Vermilion, O.
Waterbury Brass Co., Waterbury, Ct.
Weber Bros. Metal Wks., Chicago.
Wilcox Co., W. W., Chicago, Ill.

SHIELDS, LINEMEN'S.
See Protectors, Linemen's.

SHIFTERS, Gear, Automobile (Elec.)

CUTLER-HAMMER MFG. CO., Milwaukee, Wis., "Vulcan."

SHOCK COILS.—See Electro Therapeutical Apparatus; also Toys & Novelties.

SHOE DRIERS. See Driers, Hair

SHOE POLISHERS.
See Polishers, Shoe.

SHOW CASE FIXTURES.
See Fixtures, Show Case.

SHOWER PANS, PLATES AND CANOPIES—See Shells, Chandelier.

SIDEWALK PROJECTORS.
See Projectors, Sidewalk.

SIGN LETTERS.—See Letters, Sign

SIGN RECEPTACLES.—See Sockets and Receptacles, Standard.

SIGNALS, Automobile.

Rear End—Which Way—Traffic.
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Auto Signal Lite Co., New York (Stop-Right-Left).
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Nokolyd Signal Co., New York.
Roberts, F. C., Detroit, Mich., "Detroit."
Rothermich, A. P., St. Louis, Mo.
Standard Signal Lamp Co., Bridgeport, Conn.

SIGNALS, ELEVATOR.
See Elevator Safety Devices.

SIGNALS, Factory & Office.

American Model & Instrument Co., Worcester, Mass.
Autocall Co., Shelby, O.
Electro-Call Signal Co., Cleveland, O.
Mead Elec. Signal Co., Cleveland, O., "Tele-Call."
Multi Signal Co., Boston, Mass.
National Scale Co., Chicopee Falls, Mass., "Multi-Call."
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NOVELTY ELEC. CO., 50 N. 4th st., Philadelphia, Pa.

Universal Flash Light Signal Co., Duluth, Minn.
Cory & Sons, Charles, New York.
Russell Elec. Co., Danbury, Conn.

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Automatic Train Stop Co., New York.
Beck Automatic Elec. Safety and Signal Switch Co., St. Louis, Mo.
Blake Signal Mfg. Co., Boston.
Bossert Mfg. Co., W. F., Utica, N. Y.
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General Railway Signal Co., Rochester, N. Y., "Standard," "Young."
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Hoeschen Mfg. Co., Omaha, Neb.
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McClintock Mfg. Co., St. Paul, Minn.
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Painter, G. F., Baltimore, Md.
Protective Signal Mfg. Co., Denver.
Richmond Co., Oshkosh, Wis.
Sandwich (Ill.) Elec. Co., "National."
Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y.
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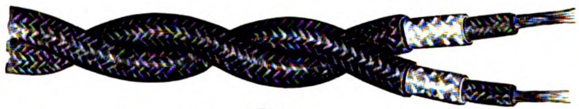

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Raven Black Core
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Easy-Bending Spellerized Steel Tube, Doubly Protected by Copper-Plating and Zinc Coating. Clean Threads. Smooth Enameled Interior.

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Easy-Bending Spellerized Steel Tube, Protected by Coatings of Special Enamel not affected by temperature conditions. Smooth Enameled Interior.

"CIRCULAR LOOM" FLEXIBLE CONDUIT
Fibre Spiral Soapstoned Interior, covered with Insulation Tape and a heavy Woven Cotton Jacket.

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Seamless Interwoven Canvaslike Soapstoned Interior covered by a Light Cotton Braid. Clean to Handle and Easy to Cut and Fish.

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Seattle: H. G. Behneman, Inc., - - - - 617 Fourth Ave.
Los Angeles: R. B. Clapp, - - - 600 San Fernando Bldg.

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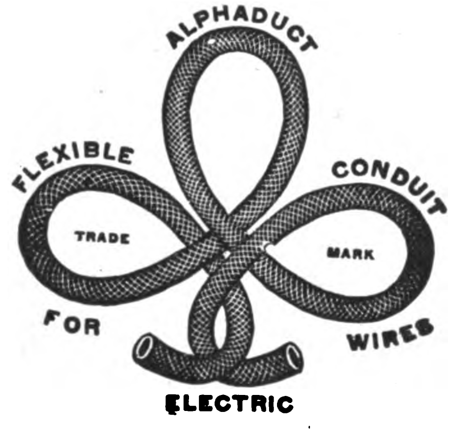
FLEXIBLE CONDUIT



"the conduit tubing with the WHITE INSIDE of cotton duck and soapstone".

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SOLDERALL CO., 143 Liberty st., New York, N. Y.
WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa., "Weldwell."

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Brunner Chemical Wks., Cincinnati, O., "Queens."
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Knoblock-Heideman Mfg. Co., South Bend, Ind. ("Bulldog" Paste).
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See Irons, Soldering.
SOLDERING POTS.
See Pots, Melting.

SOLENOIDS.

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CUTLER-HAMMER MFG. CO., Milwaukee, Wis.

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SPARK COIL BOXES.
See Boxes, Spark Coil.
SPARK COILS. See Ignition Outfits.
SPARK GAPS.
See Instruments, Testing.
SPEAKING TUBES.
See Tubes, Speaking.
SPEEDOMETERS.
See Tachometers.
SPINNING METAL.—See Shells.
SPLICE PROTECTORS.
See Blocks, Moulding.
SPLICERS, SOCKET CHAIN.
See Links, etc.
SPLICING CLAMPS.
See Clamps, Splicing.
SPLICING GUM—See Tape.
SPOOLS.—See Reels, Wire.
SPOT LIGHTS—See Lights, Stage.
SPRAYS—See Decorative Lighting.
SPRING COTTERS.—See Cotters.

SPRINGS, Burglar Alarm.

Window, Door.

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OSTRANDER & CO., W. R., 22 Dey st., New York, N. Y.

Bernz, Otto, Newark, N. J.
Farrington & Co., Mt. Vernon, N. Y.

SPRINGS, Hair.

MANROSS & SONS, F. N., Forestville, Conn.

SPRINGS, Small.

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BARNES CO., WALLACE, South and Wallace sts., Bristol, Conn.
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MORGAN SPRING CO., Worcester, Mass.
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Chase-Duniplace Co., Toledo, O.
Cleveland (O.) Wire Spring Co.
Cook Spring Co., New York, N. Y.
Detroit Wire Spring Co., Detroit.
Farrington & Co., Mt. Vernon, N. Y.
Gibson Co., Wm. D., Chicago, Ill.
Hepp, George A., Newark, N. J.
Hubbard Spring Wks., Pontiac, Mich.
Miller Wire Spring Co., Bridgeport, Ct.
Peck & Young Mfg. Co., Forestville, Conn.
Raymond Mfg. Co., Corry, Pa.
Union Spring & Mfg. Co., New Kensington, Pa.
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SPUDS.—See Tools, Pole.
STAGE DIMMERS.—See Rheostats.
STAGE LIGHTS—See Lights, Stage.
STAGE PLUGS.
See Plugs and Receptacles.

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For Making Metal Stampings.
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Bliss Co., F. W., Brooklyn, N. Y.
Hibbard Mfg. Co., Brooklyn, N. Y.
V. & O. Press Co., Glendale, L. I.

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Oakville Co., Waterbury, Conn.
Osborn & Stephenson Mfg. Co., Plainville, Conn.
Scoville Mfg. Co., Waterbury, Conn.
Stearns Stamping Co., W. H., Worcester, Mass.
Stimpson Co., Edwin B., Brooklyn, N. Y.
Unique Findings & Supply Co., Providence, R. I.
Waterbury (Conn.) Mfg. Co.
Waterbury (Conn.) Metal Products Co.

STAMPINGS, SHEET METAL.
See Shells, Chandelier.
STANDS, ARMATURE.
See Machines, Armature.
STAPLE DRIVERS.
See Drivers, Staple.

STAPLES & TACKS, Plain.

MORGAN SPRING CO., Worcester, Mass.
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Parker Wire Goods Co., Worcester.
Titchener & Co., Binghamton, N. Y.
Wright Wire Co., Worcester, Mass.

STAPLES & TACKS, Insulating.

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Insulating Saddle Staple Co., Brockton, Mass.
Morley Mfg. Co., Boston, Mass. ("Millanite Perfection" Nail).

STAR DELTA SWITCHES.
See Switches, Motor Starting.

STARTERS, Motor.

A. C. Polyphase compensator type.
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Allis-Chalmers Mfg. Co., Milwaukee.
Fairbanks-Morse Elec'l Mfg. Co., Indianapolis, Ind.

STARTERS, AUTOMOBILE.
See Systems, Auto.
STARTING BOXES, NON-RESISTANCE TYPE. — See Switches, Motor Starting.
STARTING BOXES, RESISTANCE TYPE.—See Rheostats.
STATIC MACHINES.—See Electro-Therapeutical Apparatus.

STATUARY, Bronze.

For Portables and Fixtures.
Art Chandelier & Bronze Co., New York, "Novo-Bronzes."
Bradley & Hubbard Mfg. Co., Meriden, Conn.
Miller & Co., Edw., Meriden, Conn.

STATUARY, POTTERY.
See Pottery.
STEAM BOILER HEATERS.
See Boilers, Electric.

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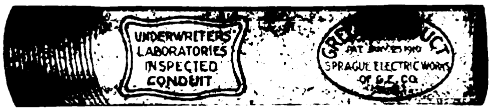
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Only Hot Galvanized Conduit on the market and acknowledged by eminent engineers to be

THE BEST

The galvanizing is of equal quality on both exterior and interior surfaces.

Concrete readily sets around

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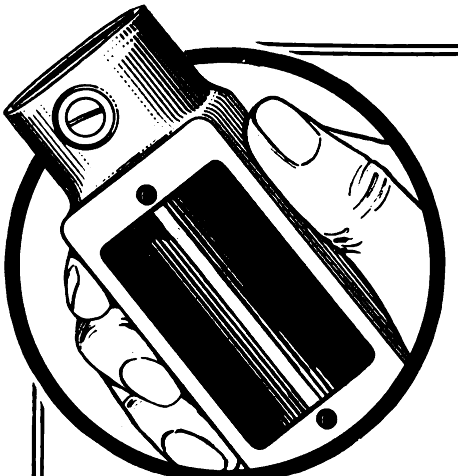

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The set screws in the hubs of Pipe-Taplets are great time savers for wiremen because they do not have to thread or cut the pipe so exactly.

Every Pipe-Taplet cover fits two sizes of Pipe-Taplets, and this cuts your cover stock in half.

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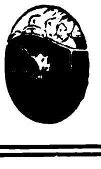
NAMES

With some products the names alone are worth millions. Why? Because people generally buy an article solely on their faith in a name. Consider this fact and you will have the strongest possible argument for using Westinghouse McCandless Mazda Miniature lamps. *Do you know of any other names in the miniature lamp business which mean more than* Westinghouse *and* McCandless?



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THREAD PROTECTED
ENAMELED CONDUIT
STANDARD

Cuts Costs
Saves Time
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"BLACK" ENAMELED AND "WHITE" GALVANIZED

Friction Tape **Splicing Compounds**
Armature Tapes

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Warehouses, Boston, New York, Buffalo, Chicago

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Flashes a Lamp—Anywhere

Winks the Window Signs. Saves 50% of the Current. Skeedoodle Socket Plugs fit any standard socket, operates on any voltage from 100 to 250, and on any lamp from 20 to 60 watts. Just the thing for electric advertising displays of all kinds.

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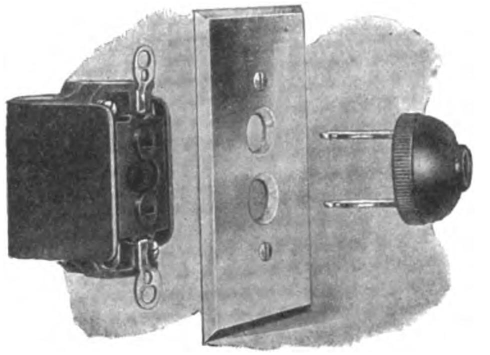

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COMPLETE WITH PLATE
HIGH GRADE BUT MADE
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See Machines, Steel Bending.
STEEL CABINETS.
See Cabinets, Sheet Steel.

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STEERING WHEEL WARMERS.
See Warmers, Steering Wheel.
STEMS.—See Studs, Fixture.

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Capitol Elec. Co., Salt Lake City, Utah, "McBride."
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STEREOPTICON LAMPS.
See Lamps, Stereopticon.
STERILIZERS, DENTISTS.
See Heaters, Liquid.

STERILIZERS, Instrument.

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GENERAL ELECTRIC CO., Schenectady, N. Y.
SIMPLEX ELECTRIC HEATING CO., Cambridge, Mass.
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Halverson Co., Portland, Ore.
Victor Elec. Co., Chicago, Ill.
Wilmot Castle Co., Rochester, N. Y., "Castle-Rochester."

STERILIZERS, Water, Electric.

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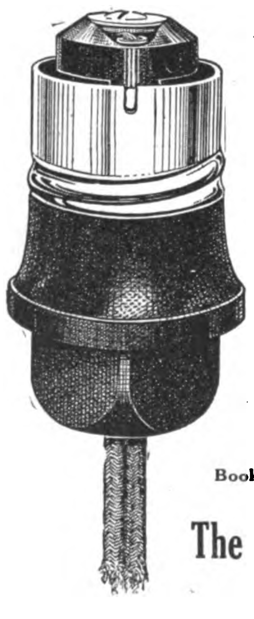
Kelley Reamer Co., Cleveland, O.
Nye Tool & Mach. Wks., Chicago.
Oster Mfg. Co., Cleveland, O.
Walworth Mfg. Co., Boston, Mass., "Miller's" "Ruff & Tuff."
Wells Bros. Co. Division Greenfield Tap & Die Corporation, Greenfield, Mass, "Trio," "Little Giant."
Wells & Son Co., Greenfield, Mass.
Wiley & Russell, Greenfield, Mass., "Lightning."
Yonts Co., C. H., Meadville, Pa.

STORAGE BATTERIES.
See Batteries, Storage.
STORAGE BATTERY CUTTERS.
See Cutters, Storage Battery.
STOVES, COOKING.—See Cooking.
STOVES, HEATING—See Radiators
STRAIN INSULATORS—See Porcelain; also Trolley Line Material.
STRAIN RELIEF GRIPS.
See Grips, Strain Relief.
STRAPS, CROSS ARM.
See Braces, Cross Arm.
STRAPS, JACK.—See Bags, Belts.
STRAPS, PIPE.
See Hangers and Clamps.
STRETCHERS, WIRE.
See Comealongs.
STRIPS, FUSE.
See Fuses, Enclosed.



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Attachment Plugs

Made on new, different and improved lines.

Instantly connected by inserting and making slight turn to right. Disconnects by reversing operation.

Fits any Edison outlet. Avoids use of special equipment.

The only Quick-Make-and Break Plug of unitary construction. No expense for wiring or reassembling.

Booklet with full description, and prices on request.

The Yost Electric Mfg. Co.
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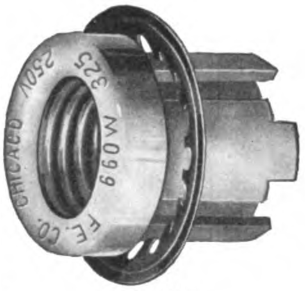

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No. 325

This FEDERAL Clamp Socket

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Signs—trough lighting—outlet boxes—heavy porcelain—copper shell — open terminals. Fits standard 1½ in. hole.

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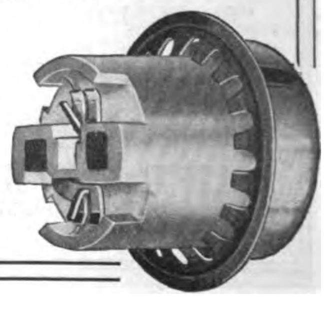

Let me cut your wiring
COST
Wired in a jiffy

I Make Action Out on the Job!

I will save time and money for you on every job; cut your wiring costs and add to your profits.

I am built for big, busy contractors and dealers who appreciate time-saving features—who want Quality through and through. I will make and save them money.

The "BEST" Swivel Attachment Plug

is wired in a jiffy. Two leads from the cap—one for each wire, direct to its binding post. Ample wiring room.

Made of Asbestos Composition; proof against fire and water; cannot chip like porcelain; practically indestructible. Brass screws throughout; all metal parts brass, copper and bronze. It is guaranteed absolutely—and wired in a jiffy.

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Best Electric Company
PITTSBURGH, PA.

"Kutsch"
Improved
Receptacle and Plug
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Made of highest grade porcelain. Capacity 50 Amperes, 125 Volts. The best available receptacle and plug for theatres, electric automobiles, storage batteries and portable motors.

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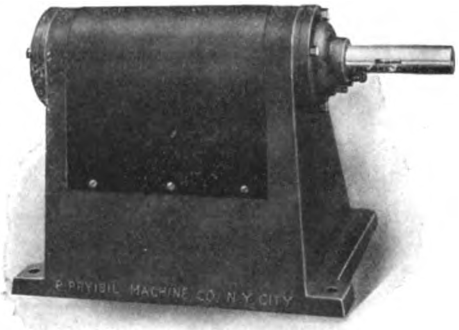

$35.

Any spindle, single end or double end as desired.

Metal Spinning Lathes and Accessories for Round and Oval Work.

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The Hardware MAKES the line.
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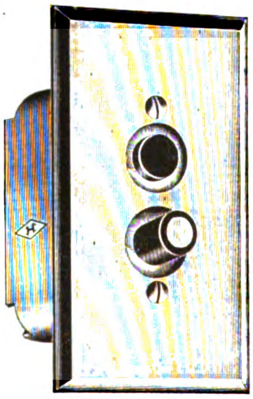
Make Satisfied Customers

FOR YOURSELF

They will be your greatest asset. You can do this quickly and surely by using the "Diamond H" line on all your jobs.

A "Diamond H" switch once installed is always installed, and you have the satisfaction of knowing that it can't go wrong, that it will always work satisfactorily and be a constant reminder of the high grade of work you do.



"Diamond H" switches are not built to meet a price—they are built to fill a want for an absolutely dependable—mechanically and electrically—perfect high grade switch that will stand the test of time and make good under all conditions and circumstances.

You can't afford to use inferior switches on any job, for on the satisfaction of that particular installation may depend some big contract for you.

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STEEL CITY ELECTRIC CO., 1207 Columbus ave., Pittsburgh, Pa., "Star."
THOMAS & BETTS CO., 103 Hudson st., New York, N. Y., "T. & B.," "Lakin" Hickey.
TRUMBULL ELECTRIC MFG. CO., Plainville, Conn.
WIRT CO., Germantown, Philadelphia, Pa. (Hickies).

Bonnell Co., W. A., New York.
Cinch Expansion Bolt & Engineering Co., New York, N. Y.
Colgan Co., W. H., West Newton, Mass.
Grabler Mfg. Co., Cleveland, O.
Harvard Electric Co., Chicago, Ill.
Pittsburgh Valve & Fittings Co., Barberton, O.
Rattan Mfg. Co., New York, N. Y.
Wilton Mfg. Co., Wrightsville, Pa. ("Wi-co Hangstrait" Hickey).

SUB-STATIONS. See Towers, Steel.

SUB BASES, Snap Switch.

Gier & Dail Mfg. Co., Lansing, Mich.

SUBMARINE CABLES.
See Wire, Lead Encased.

SUPPLIES, Electrical.

ADAM ELECTRIC CO., FRANK, St. Louis, Mo.
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COMMERCIAL ELECTRICAL SUPPLY CO., St. Louis, Mo.
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STANLEY & PATTERSON, 23 Murray st., New York, N. Y.
WESTERN ELEC. CO., New York.
WORTHINGTON CO., GEO., Cleveland, O.

SUPPORTERS, BOX.
See Hangers, Fixture.

SUPPORTERS, INSULATOR.
See Clamps, Insulator.

SURFACERS. See Cleaners, Floor.

SURGICAL APPLIANCES. — See Electro-Therapeutical Apparatus.

SWEEPERS, CARPET.
See Cleaners, Vacuum.

SWITCH PLATE ADJUSTERS.
See Adjusters, Switch Plate.

SWITCHBOARD CLEANERS.
See Cleaners, Switchboard.

SWITCHBOARD INSULATORS.
See Insulator, Switchboard.

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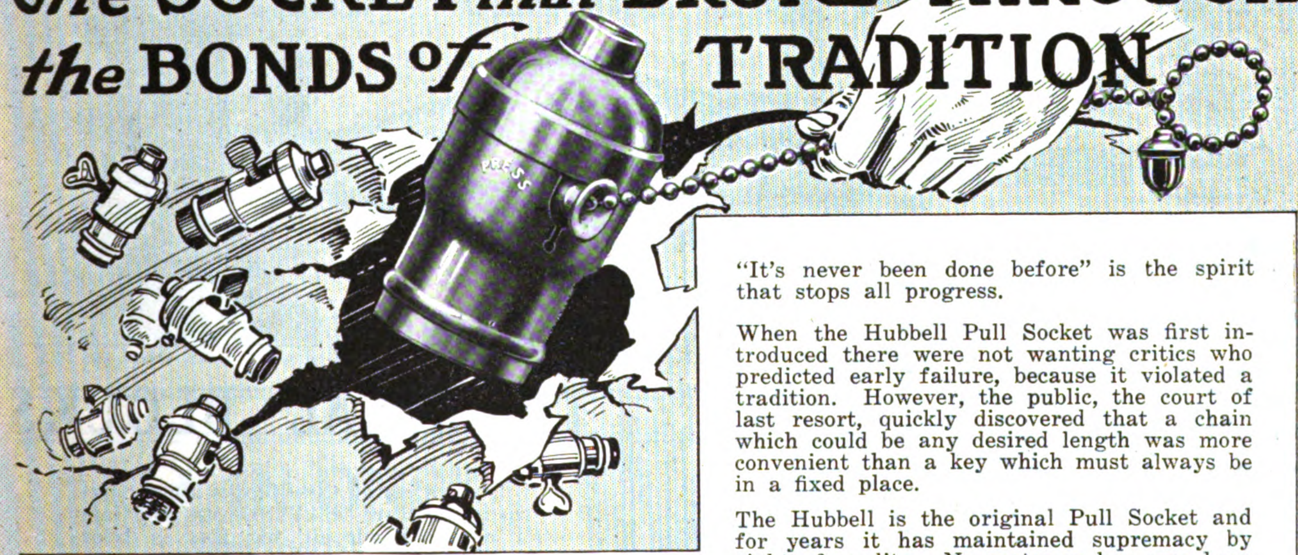

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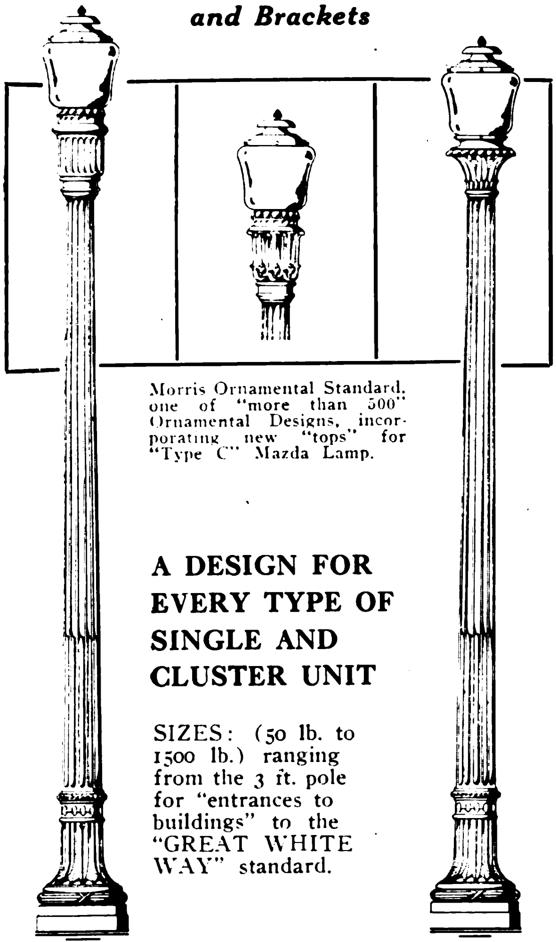

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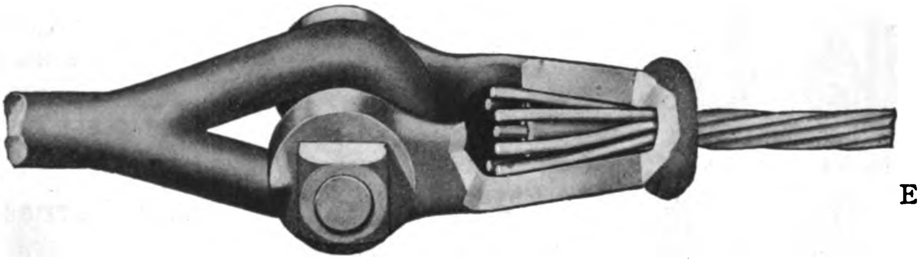

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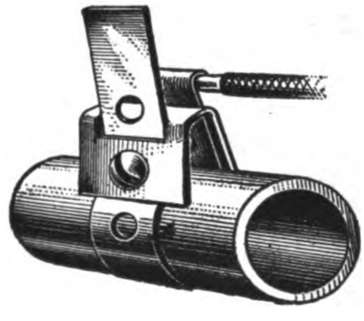

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See Switches, Pull.

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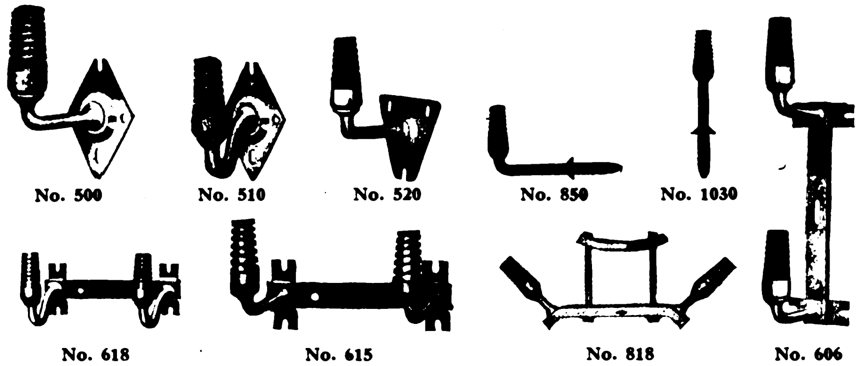

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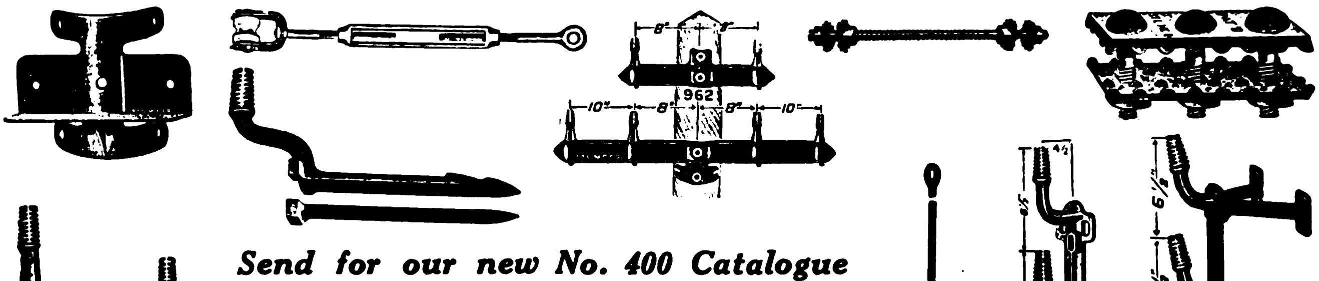

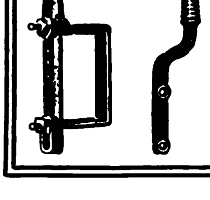

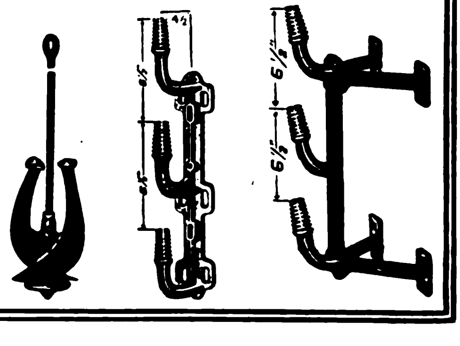

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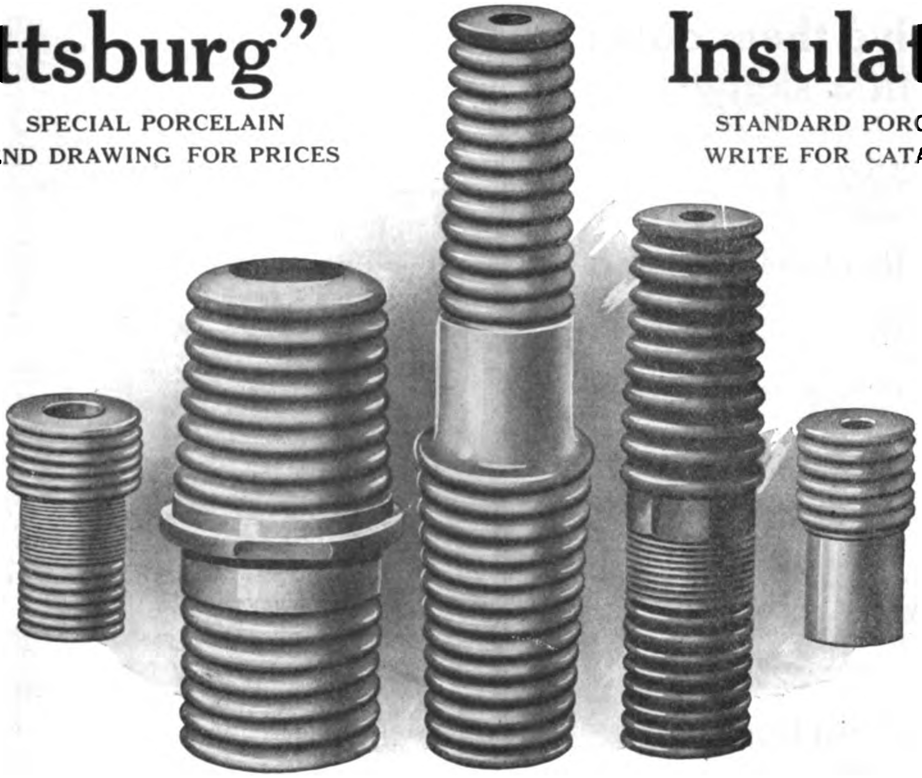

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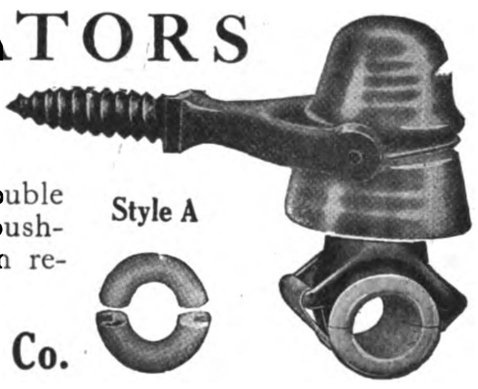

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See Switchboards.

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See Switches, Pull.

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See Switches, Tank.

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SWITCHES, KNIFE.
See Switchboards, Lt. & Pr.

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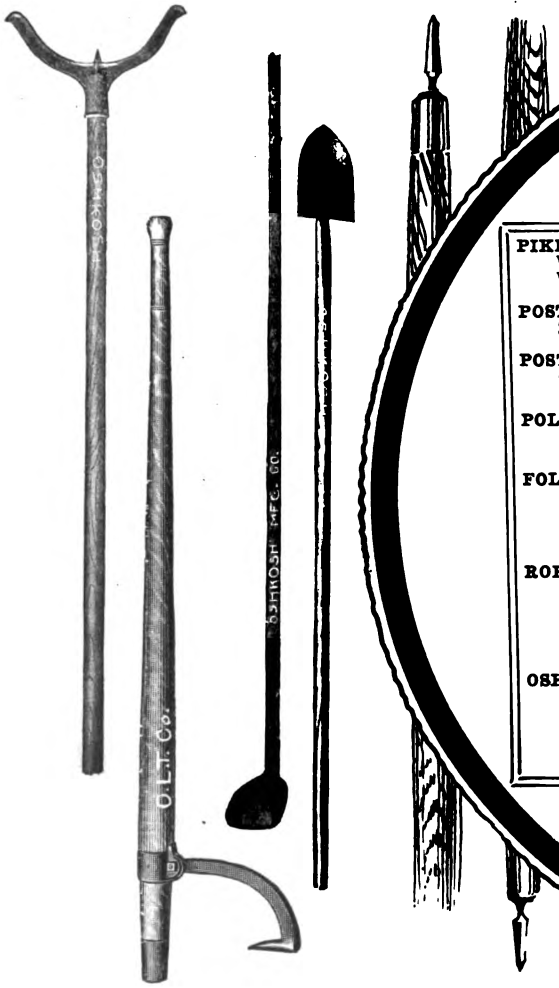
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The Gilmore Mazda is perfection—all a Mazda Lamp can be. And you'll do business with a careful manufacturer who takes a personal interest in you.

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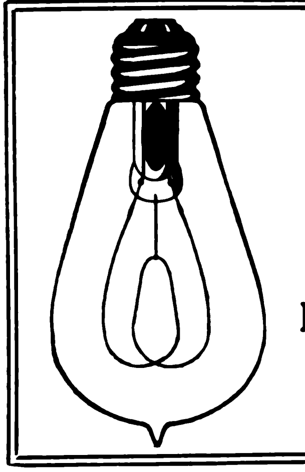

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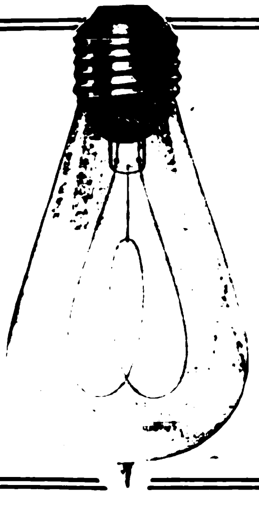

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LICENSED UNDER U.S. PATENTS
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American made—
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The Lamp with the Guarantee

We guarantee that the average Hygrade Tungsten Lamp has a stronger filament and will give better service than any other Tungsten lamp.

We agree to replace or give credit for any shipment of Hygrade Tungsten lamps which does not live up to this guarantee.

By service we mean quality of light, length of life, strength—all that lamp service means both to the technical man and to the ultimate consumer.

We can make this guarantee because Hygrade Tungsten lamps are American made in our own factory in Danvers, Mass., and were put on the market only after four years of preparation. Because, too, they are made under the direct supervision of the principals of the company.

Hygrade Guaranteed Tungsten lamps come in individual cuffs, five lamps to the carton, the cartons shipped in corrugated board boxes. On each lamp, carton and box is the Hygrade trademark in red.

We have an interesting proposition for dealers. Ask us why Hygrade Tungsten lamps are best for the consumer and most profitable for the dealer.

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Butte Engineering & Elec. Co., San Francisco, Cal.
Delta-Star Elec. Co., Chicago, Ill.
Electric Controller & Mfg. Co., Cleveland, O.
Leonard-Bundy Elec. Co., Cleveland, O.
Mutual Elec. & Mfg. Co., Wheeling. W. Va.
Trio Mfg. Co., Rock Island, Ill.

SWITCHES, Oil Break.

CAMPBELL ELECTRIC CO., Lynn, Mass.
CONDIT ELECTRICAL MFG. CO., Boston, Mass.
GENERAL ELECTRIC CO., Schenectady, N. Y.
HIGH TENSION ELECTRICAL SPECIALTY CO., Newton, Mass.
WESTINGHOUSE ELECTRIC & MFG. CO., East Pitsburgh, Pa.
Kelman Elec. & Mfg. Co., Los Angeles, Cal.
Multitype Elec. Mfg. Co., Chicago, Ill.
Pacific Elec. & Mfg. Co., San Francisco, Cal.
Ricker Mfg. Co., Rochester, N. Y.
Trio Mfg. Co., Rock Island. Ill.

SWITCHES, Pendant.

BENJAMIN ELECTRIC MFG. CO., 120 So. Sangamon st., Chicago, Ill.
CUTLER-HAMMER MFG. CO., Milwaukee, Wis., "Acorn."
GENERAL ELECTRIC CO., Schenectady, N. Y.
HART & HEGEMAN MFG. CO., Hartford, Conn., "H. & H."
HUBBELL, HARVEY, Bridgeport, Conn. (Pull Chain).
PASS & SEYMOUR, Solvay, N. Y.
PERKINS ELEC. SWITCH MFG. CO., Bridgeport, Conn.
UNION ELECTRIC CO., Trenton, N. J.
Arrow El. Co., Hartford, Ct., "Arrow E."

SWITCHES, Pressure Regulating.

To Automatically Maintain Pressure.

CUTLER-HAMMER MFG. CO., Milwaukee, Wis.
MARTIN & ANSON CO., 2226 Indiana ave., Chicago, Ill.
Auto Switch Co., New York.
Industrial Controller Co., Milwaukkee.
Leader Iron Wks., Decatur, Ill.

SWITCHES, Pull

Fixture—Ceiling.

BRYANT ELECTRIC CO., Bridgeport, Conn.
CUTLER-HAMMER MFG. CO., Milwaukee, Wis.
HUBBELL, HARVEY, Bridgeport, Conn. (Pull Chain).
PASS & SEYMOUR, Solvay, N. Y.
PERKINS ELEC. SWITCH MFG. CO., Bridgeport, Conn.
WALDMAN, JOHN J., 136 Liberty st., New York, N. Y., "Jones-Perfection."
Arrow Elec. Co., Hartford, Conn., "Arrow E."
Krantz Mfg. Co., Brooklyn, N. Y.
Sorenson, P., Brooklyn, N. Y.

SWITCHES, PUSH BUTTON.

See Switches, Snap.

SWITCHES, Remote Control.

Magnetically Operated.

CONDIT ELECTRICAL MFG. CO., Boston, Mass.
CUTLER-HAMMER MFG. CO., Milwaukee, Wis.
GENERAL ELECTRIC CO., Schenectady, N. Y.
HART MFG. CO., Hartford, Conn., "Diamond H."
PALMER ELEC. & MFG. CO., Franklin and Congress sts., Boston, Mass., "H. P."
A. G. Elec. & Mfg. Co., Seattle.
Anderson Mfg. Co., Albert & J. M.
Automatic Switch Co., New York, N. Y., "Darrin."
Baruch Elec. Controller Co., San Francisco, Cal.
Drendell Elec'l Mfg. Co., San Francisco, Cal.
J. & J. Elec. Co., Memphis, Tenn.
Sandwich Elec. Co., Sandwich, Ill.
Sundh Elec. Co., New York, N. Y.
Tittle, H. S., San Francisco, Cal.
Walker Elec. Co., Philadelphia, Pa.

SWITCHES, Reversing.

Demagnetizing Switches.
Reversing Switches.
Limit Switches.

CUTLER-HAMMER MFG. CO., Milwaukee, Wis. ("Palmer" Limit Switch).
D. & W. FUSE CO., Providence, R. I. (Chuck Demagnetisers).
GENERAL ELECTRIC CO., Schenectady, N. Y.
WESTINGHOUSE ELEC. & MFG. CO., East Pittsburgh, Pa.

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National Lamp Works of General Electric Co.
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NITROGEN UNIT

No. 7812—Diameter 12 in., Depth 12 in., Fitter 8 in.

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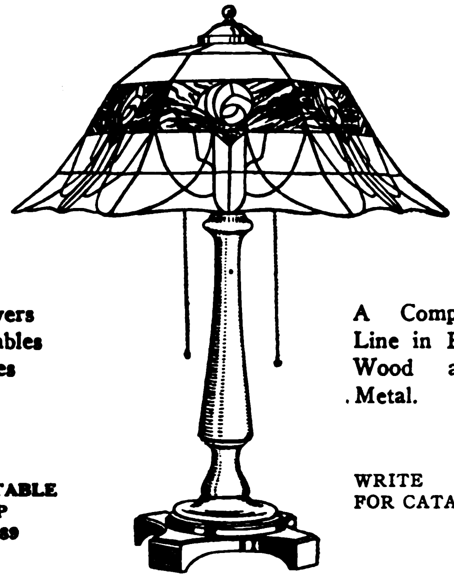

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No. 689

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Butte Engineering & Elec. Co., San Francisco, Cal.
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Flush—Push Button—Rotary.

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CONNECTICUT TELE. & ELEC. CO., Meriden, Conn.
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CUTTER CO., Philadelphia, Pa. ("C. S." Push Button).
GENERAL ELECTRIC CO., Schenectady, N. Y.
HART MFG. CO., Hartford, Conn., "Hartford," "Diamond H."
HART & HEGEMAN MFG. CO., Hartford, Conn., "H. & H."
MANHATTAN ELECTRICAL SUPPLY CO., 17 Park pl., New York.
METROPOLITAN ELEC. MFG. CO., 14th st. and East ave., Long Island City, N. Y. (Detachable Push Button).
PERKINS ELECTRIC SWITCH MFG. CO., Bridgeport, Conn.
TRUMBULL ELECTRIC MFG. CO., Plainville, Conn. ("Circle T" Rotary and Push Button).
UNION ELECTRIC CO., Trenton, N. J.

Arrow El. Co., Hartford, Ct., "Arrow E."
Gordon Elec. & Mfg. Co., Chicago, "Gem" Push Button.
Keil & Son, Francis, New York.
New Haven Elec. Mfg. Co., North Haven, Conn. (Rotary).
Standard Elec. Mfg. Co., Chicago, Ill., "National."

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Automatic Disconnecting.

Hartman Elec'l Mfg. Co., Mansfield, Ohio.

SWITCHES, Tank.

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FORT WAYNE ELEC. WKS. OF G. E. CO., 1412 Broadway, Fort Wayne, Ind. (Pump).
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PARTRICK & WILKINS CO., Philadelphia, Pa.
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Automatic Switch Co., New York.
Chicago Pump Co., Chicago, Ill.
Electrical Repair Co., New York.
Irish Electric Co., W. F., New York, "Shamrock."
Kewanee (Ill.) Water Supply Co.
Pringle Elec'l Mfg. Co., Phila., Pa.
Sundh Elec. Co., New York, N. Y.
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GENERAL ELECTRIC CO., Schenectady, N. Y.
HARTFORD TIME SWITCH CO., 101 Warren st., New York, N. Y.
McGILL MFG. CO., 39 Oak st., Valparaiso, Ind., "Crescent."
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RELIANCE AUTOMATIC LTG. CO., 520 College ave., Racine, Wis.
REYNOLDS ELEC. CO., 422 S. Talman ave., Chicago, Ill.
WALDMAN, JOHN J., 136 Liberty st., New York, N. Y.

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A. & W. Elec. Sign Co., Cleveland, O.
Ballou-Hutchins Electric Co., Providence, R. I.
Central Burglar Alarm Co., Chicago, Ill., "Reliable."
Chicago Elec. Time Switch Co., Chicago, Ill., "Aristo."
Dixon, Paul, Atlanta, Ga. (Automatic Cut-Off).
Rorland, Leslie C., Poughkeepsie, N. Y.
Electric Flasher Co., New York, N. Y., "Universal."
Empire Engrg. & Supply Co., New York.
Hansen Mfg. Co., Princeton, Ind., "Simplex."
Industrial Controller Co., Milwaukee, Wis. (Automatic Cutout).
Kennedy-Webster Co., Chicago, Ill., "Commonsense."
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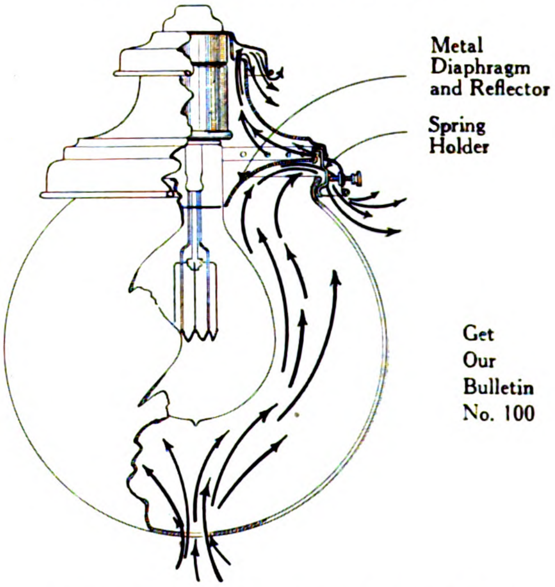

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S 741—Dec. 3.

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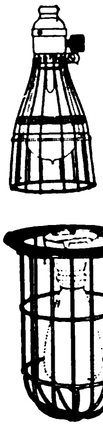

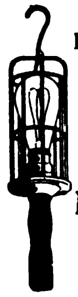

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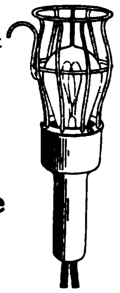

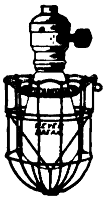

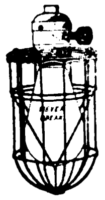

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Jones El. Starter Co., Chicago, "Jesco."
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TABLE CLAMPS.
See Clamps, Table.

TABLES, Power.

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Garford Mfg. Co., Elyria, O.
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TACKS.—See Staples and Tacks.

TAGS, Cable.

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TAMPING BARS.
See Tools, Pole Handling.

TANK ALARMS. — See Alarms, Tank; also Switches, Tank.

TANTALUM.—See Lamps, Inc.

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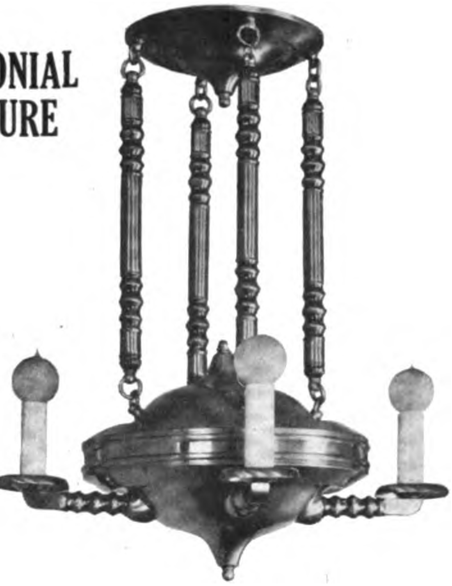

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DUNTON CO., M. W., Providence, R. I., "Black Diamond," "Gibraltar," "Verifax."
GENERAL ELECTRIC CO., Schenectady, N. Y., "Acme," "Paragon."
KANTER & CO., E. W., 158 Purchase, Boston, Mass., "Champion," "Higrade," "Winner."
MARION INSULATED WIRE & RUBBER CO., Marion, Ind.
MICA INSULATOR CO., 68 Church st., New York, N. Y., "Linotape," "Mico," "Vesey."
N. Y. INSULATED WIRE CO., 114 Liberty st., New York, N. Y., "Grimshaw," "Competition."
PACKARD ELECTRIC CO., 520 Dana ave., Warren, O.
ST. LOUIS RUBBER CEMENT CO., St. Louis, Mo., "C. G." "Gibraltar," "G. G. Gray," "White Mason," "Gray Armature," "Eureka."
SCHOONMAKER CO., A. O., 66 Park pl., New York (Oiled Muslin).
STANDARD PAINT CO., Woolworth Bldg., New York, N. Y., "P. & B."
WALPOLE TIRE & RUBBER CO., Walpole, Mass., "Norfolk," "Kachouk," "Dryfield," "Gold Seal."
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Bishop Gutta-Percha Co., New York, "Chatterton's" Compound.
Elkhart Rubber Wks., Elkhart, Ind., "Hydro-Proof."
Goodrich Co., B. F., Akron, O.
Gorham-Revere Rubber Co., San Francisco, Cal.
Imperial Rubber Co., New York, N. Y., "Irco."
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KERITE INS. WIRE & CABLE CO., New York.
Lord Mfg. Co., Brooklyn, N. Y., "Lormco."
Mechanical Rubber Co., Cleveland, "Buckeye," "Ideal," "Meruco," "Perfection," "Utility."
Minerallac Electric Co., Chicago, Ill.
New Jersey Car Spring & Rubber Co., Jersey City, N. J.
Okonite Co., New York, "Manson."
Penn Rubber Co., Jeanette, Pa.
Schenectady (N. Y.) Linolite Co.
Standard Woven Fabric Co., Framingham, Mass. "Multico," "Stanwove," "Multibestos."
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TAPING MACHINES.
See Machines, Armature.

TAPPERS, WINDOW.
See Advertising Devices.

TAPS.—See Stocks, Dies, Reamers.

TAPS, Current.

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BRYANT ELECTRIC CO., Bridgeport, Conn.
HUBBELL, HARVEY, Bridgeport, Ct.
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TELEPHONES, Limousine.

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American Electric Co., Chicago, Ill., "Burns," "American Beauty," "Samson," "Leich," "Zobel."
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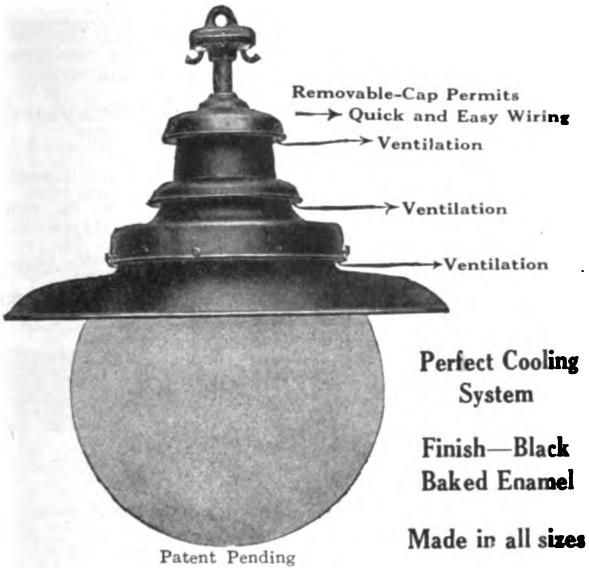

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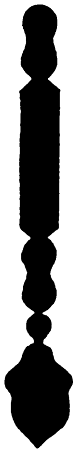

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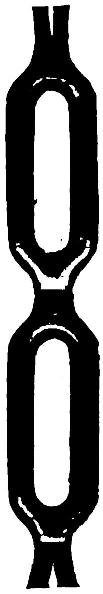
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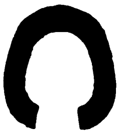
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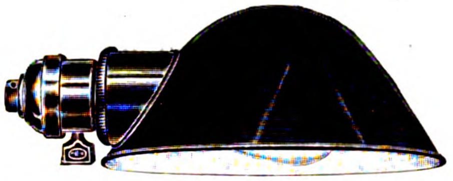

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See Fittings, Distribution.

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TERMINALS, WIRE.—See Connectors, Battery; also Lugs, Terminal.

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See Clamps, Test.

TEST SETS.
See Instruments, Testing.

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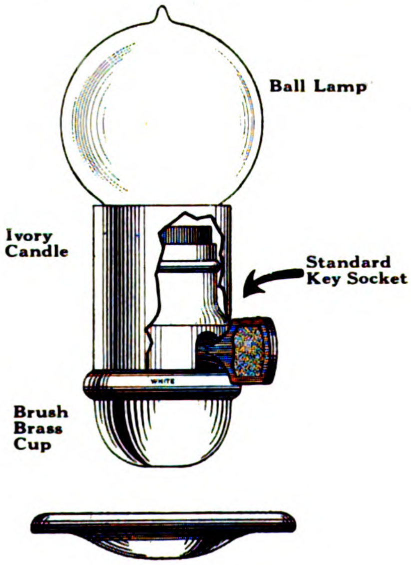

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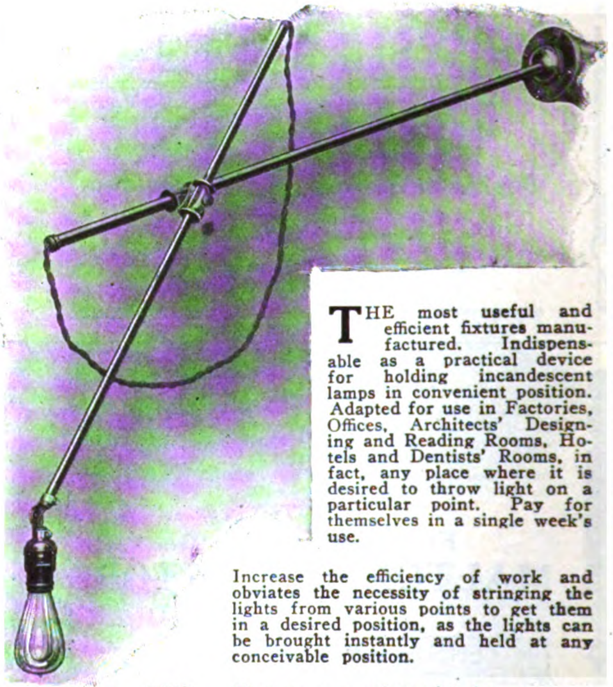

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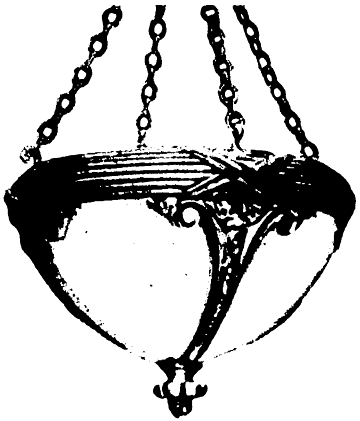
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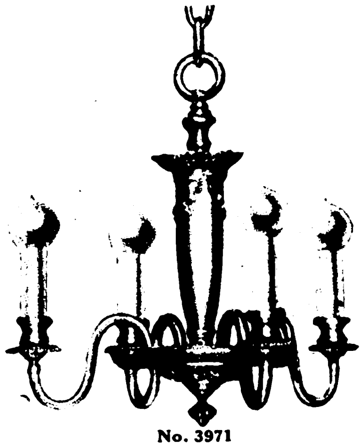
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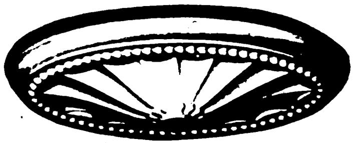
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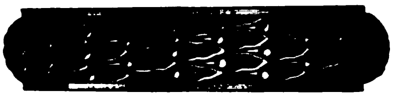
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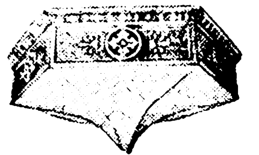
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See Formers, Tie Wire.

TIES, Wood.
See Page 199

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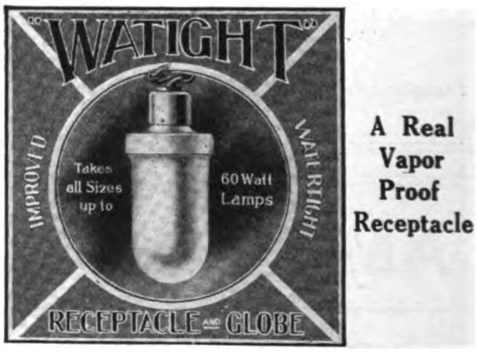

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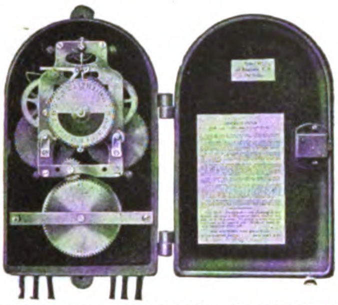

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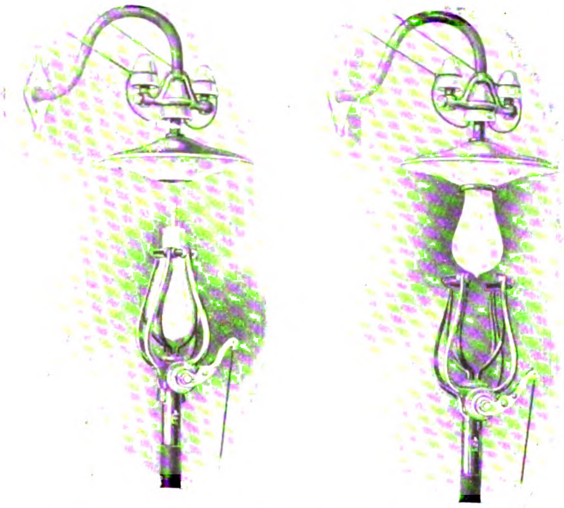

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TOOLS, Pole Handling.

Canthooks.
Raising Forks.
Carrying Hooks.
Pike Poles.
Pole Supporter.
Digging Bars.
Tamping Bars.
Digging Spoons.
Spuds-Diggers.

ELECTRIC OPERATIONS CO., Bush Terminal, Brooklyn, N. Y.

HUBBARD & CO., Pittsburgh, Pa.

OSHKOSH MFG. CO., Oshkosh, Wis.

Ames Shovel & Tool Co., N. Easton, Mass.
Beall Bros., Alton, Ill.
Buckeye Mfg. Co., Canton, O., "Lock Lever."
Champion Tool & Handle Works, Evart, Mich. (Pike Poles).
Channon Co., H., Chicago, Ill.
Columbus (Ind.) Handle & Tool Co.
Dicks Tool Co., Downers Grove, Ill.
Everstick Anchor Co., St. Louis, Mo. ("Blackburn's" Telescoping Auger Handles).
Fenn Mfg. Co., Charlotte, Mich. (Diggers).
Hallett Iron Works, Harvey, Ill.
Iwan Bros., South Bend, Ind. (Post Hole Augers).
Klein & Sons, M., Chicago, Ill.
Meckel, Fred L., Chicago, Ill.
Pittsburgh Shovel Co., Pittsburgh, Pa.
Standard Earth Auger Co., Chicago.
Wyoming Shovel Wks., Wyoming, Pa.

TOOLS, Portable, Hand.

Reamers.
Polishers' Grinders.
Buffers' Hammers.
Drills, Screw Drivers.
Valve Grinders.
Post Center Drive and Bolted. (Motor Driven.)

GENERAL ELECTRIC CO., Schenectady, N. Y. (Drills).
WESTINGHOUSE ELEC. & MFG. CO., East Pittsburgh, Pa. (Drills).
WISCONSIN ELEC. CO., 1635 Junction ave., Racine, Wis. ("Dunmore" Grinders).

American Elec. Tool Co., West Newton, Mass., "Carver" (Drills).
American Elec. Tool Co., Petersburg, Va. (Hammers).
Anderson Co., St. Louis, Mo. (Grindstones and Drills).
Black & Decker Mfg. Co., Baltimore, Md. (Drills).
Caldwell & Co., J. E., Philadelphia, Pa. (Silver Cleaners).
Carver & Co., A. F., Newtonville, Mass., Grinders, Drills.
Chicago (Ill.) Pneumatic Tool Co. ("Little Giant" and "Duntley" Drills, Spike Drivers and Grinders).
Cincinnati (O.) Elec'l Tool Co., "Peerless" (Drills, Reamers and Grinders).
Clark, Jr., El. Co., James, Louisville, Ky. ("Willey" Drills, Grinders and Buffers).
Coates Clipper Mfg. Co., Worcester, Mass. (Drills, Grinders, Screw Drivers, Buffers, Polishers and Hammers).
Eager Elec. Co., Watertown, N. Y. (Polishers and Buffers).
Electric Tachometer Co., Phila., Pa. (Drills).
Electro-Magnetic Tool Co., Chicago, Ill. (Electric Percussion Drill for Concrete, Brick and Stone; also Hammers).
Fortuna Machine Co., New York, N. Y. (Importers Drills).
Gleason & Co., J. L., Boston, Mass (Import "Fein" Drill).
Hamilton-Beach Mfg. Co., Racine, Wis. (Grinders).
Hisey-Wolf Mach Co., Cincinnati (Drills, Grinders and Buffers).
Independent Pneumatic Tool Co., Chicago, Ill. ("Thor" Hand Drill).
Neil & Smith Elec. Tool Co., Cincinnati, O., "Ideal."
Porter, Rolland L., Chicago, Ill. (Drills).
Racine Elec. Co., Racine, Wis.
Standard Elec. Tool Co., Cincinnati, Ohio (Drills and Grinders).
Stow Mfg. Co., Binghamton, N. Y. (Buffers, Drills, Reamers, Grinders and Polishers and "Gee Whiz" Combination Tool).
Temco Elec. Motor Co., Leipsic, O. (Buffers, Valve Grinders and Drills).
U. S. Elec'l Tool Co., Cincinnati, O. (Drills, Grinders, Screw Drivers and Buffers).
Van Dorn Elec. Tool Co., Cleveland, O. (Drills, Reamers & Grinders).
Victor Elec. Co., Chicago, Ill. (Portable Polishing Outfit).
Wiley Mach. Co., Jeffersonville, Ind., ("Simple" Drills and Grinders).

TOOLS, Portable, Bench.

PRYIBIL MACHINE CO., P., 512 W. 41st st., New York.

Atwater Elec. Wks., Coopersville, N. Y. (Jewelers' and Denists' Polishers).
Besley & Co., Chas. H., Beloit, Wis. (Grinders).

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"Service"
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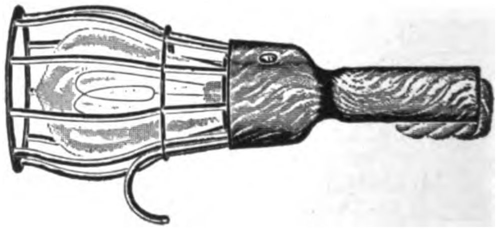

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The best medium priced portable ever made.
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TUBES
WASERS, ETC.
SPECIALTIES

WILMINGTON FIBRE SPECIALTY CO., BRANCH OFFICES "EVERYWHERE" **WILMINGTON, DEL.**

The Easiest Way On Ironing Day

American Beauty Electric Irons

Made by
American Electrical Heater Co.
Detroit, U. S. A.

Oldest and Largest Exclusive Makers

THIS IRON
Has Air Cooled Pins

A new feature in electric iron construction found exclusively in the

Wicks Famous

and it absolutely prevents the pins becoming heated, eliminating all cord and plug trouble. The heating element is wound on end and embedded in a special composition. Guaranteed to last a life time. Will increase your iron sales 50% when its many valuable features are explained.

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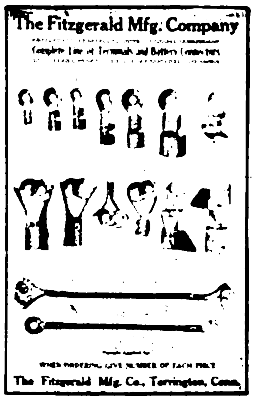
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The most complete line of

Terminals and Battery Connectors

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We will gladly send to the dealer or jobber, a sample card free of charge, quoting our best prices.

We also manufacture Electric Lighting Outfits, Electric Horns, Push Buttons.

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First, small, efficient, continuous, automatic
ELECTRIC WATER HEATER

Operates on regular 110 volt A.C. or D.C. circuit. Water and current supply controlled together. Any desired temperature. Fool proof. Attaches readily to any water feed pipe or faucet.

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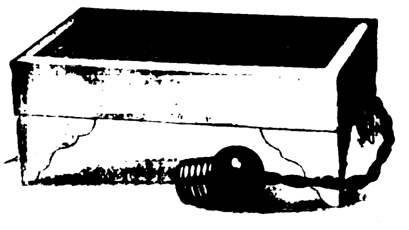

The Rapid Fire Toaster

Pat. applied for.

Operates on entirely new principles. Makes four slices of toast per minute. A reflector of 95% efficiency projects the heat upward. The top part is removable so that reflector may be polished from time to time to maintain its efficiency.

Watts 400.

Central Stations Attention

Here is the most efficient toaster ever produced, handsome in appearance and low in price. Special quantity prices to Central Stations for campaign work.

List price	$2.50
With disconnect switch	3.00

E. W. MANTER & CO.
158 Purchase St., Boston, Mass.

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Cincinnati (O.) Elec'l Tool Co.
Crane, H. G., Boston, Mass., "Drills."
Dillon Elec. Co., Canton, O. (Grinders).
Forbes & Myers, Worcester, Mass. (Grinders).
Globe Elec. Co., Chicago, Ill. (Buffers).
Neil & Smith Elec. Tool Co., Cincinnati, O., "Ideal."
Van Dorn Elec. Tool Co., Cleveland.

TOPS, ELECTRIC.—See Toys.

TORCHES & FURNACES.

Alcohol, Gasolene, Kerosene.

ALLEN CO., L. B., 4550 N. Lincoln st., Chicago, Ill. (New Allen Soldering Tool).
CARLETON CO., 174 Summer st., Boston, Mass., "Imp" Gasolene Torch.
McGILL MFG. CO., 39 Oak st., Valparaiso, Ind., Baby Gasolene Torch.
ROBERTS ELECTRIC SUPPLY CO., H. C., 905 Arch st., Philadelphia, Pa. ("Victor" and "Roberts" Alcohol Torches).
SOLDERALL CO., 143 Liberty st., New York (Alcohol Torch).
WALL MFG. SUPPLY CO., P., 705 Preble ave., Pittsburgh, Pa., "Dreadnaught" Gasolene Torch.
WESTINGHOUSE ELEC. & MFG. CO., East Pittsburgh, Pa., "Universal" Torch.

Ashton Mfg. Co., Newark, N. J., "Red Hot" Gasoline and Kerosene Torches and Furnaces.
Barnes Tool Co., New Haven, Conn., Kerosene and Gasolene Torches and Furnaces.
Bernz, Otto, Newark, N. J. ("Always Reliable" Furnace and "Galloway" Alcohol Torches).
Burgess Soldering Furnace Co., Columbus, O. ("Gem" Furnaces).
Clayton & Lambert Mfg. Co., Detroit, Mich.
Diener Mfg. Co., G. W., Chicago, Ill. ("Torrid" Alcohol, Kerosene and Gasolene).
Garrison Brass & Mach. Wks., New York, N. Y. ("Climax" Kerosene and Gasolene Torches and Furnaces).
Globe Gas Light Co., Boston, Mass. ("Barthel" Kerosene and Gasolene Torches and Furnaces).
Hauck Mfg. Co., Brooklyn, N. Y. (Kerosene Torches and Furnaces).
Hess & Son, Philadelphia, Pa., "Tinol" Alcohol Torch).
Klein & Sons, Mathias, Chicago, Ill., "Staysalite" Torch, "Turner."
Knapp Mfg. Co., New York, N. Y.
Quadriga Mfg. Co., Chicago, Ill. ("Walters" Torch).
Sun Vapor & Gas Lt. St. Co., Canton, Ohio. (Torches).
Turner Brass Wks., Sycamore, Ill., "Hot Blast," "Double Jet," "Old Reliable" Alcohol, Kerosene and Gasolene Torches and Furnaces.
Volcano Torch & Mfg. Co., Erie, Pa. (Gasolene Torches).
Wolff Mfg. Co., L., Chicago, Ill. ("Duro" Gasolene).

TOWER WAGONS.—See Wagons.

TOWERS, Steel,

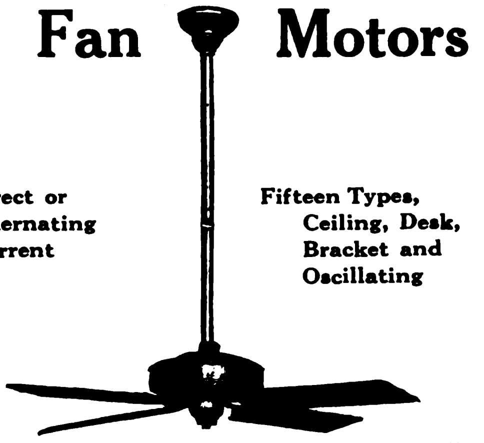
Transmission.
Transformer.
Sub-station.

Aermotor Co., Chicago, Ill.
American Bridge Co., New York. "Shiffler."
Archibald-Brady Co., Syracuse, N. Y.
Blaw Steel Const. Co., Pittsburgh, Pa., "Triplex."
Coombs & Co., R. D., New York.
Franklin Steel Co., Franklin, Pa., "Tripartite."
Los Angeles (Cal.) Switch & Signal Co.
Milliken Bros., New York, N. Y.
Riter-Conley Mfg. Co., Pittsburgh.
Ross Supply Co., Greenville, O.
Scaife & Sons Co., Wm. B., Pittsburgh, Pa.
Transmission Engineering Co., Greensburg, Pa.

TOY TRANSFORMERS.
See Transformers, L. V.

TOYS AND NOVELTIES.

Automobiles.
Canes, Flashlight.
Cars and Railways.
Electric Engines.
Electric Questioner.
Battery Motors.
Gas Engine and Dynamo.
Hand Driven Dynamos.
Locomotives.
Motors.
Motor and Dynamo Outfits.
Motor and Countershaft.
Radiopticon Picture Reflector.
Scarf Pins.
Shock Coil.
Steam Engines and Dynamos.
Switch Engines.
Water Power Plants.



"Tuerk" & "Hunter" Fan Motors

for Direct or Alternating Current

Fifteen Types, Ceiling, Desk, Bracket and Oscillating

Alternating Current Ceiling Fan Type "C"

Like all the rest of the line, Type "C," shown here, is dependable for *continuous* service. It has two speeds; four blades with 52" sweep, operating at 225 R.P.M.

"Tuerk" and "Hunter" were among the first commercially successful fans on the market, and are still the leaders.

Ask for address of nearest agency and descriptive catalog with price-lists.

Pacific Coast Stock carried by our Agents,
THE ELECTRIC AGENCY CO.,
247 Minna St., San Francisco, Cal.

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114 Liberty St., New York
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The International Electric Glue Heater

MODEL G H 1 CAPACITY 1 QT.

An important feature of this Glue Heater is that it will consume less current than any other on the market. It is furnished complete with enclosed heating element, 3-heat indicating snap switch, 6-feet of approved cord with separable attachment plug.

It is designed to operate on dry heat, and as no water is used, there can be no burnouts from evaporation or other causes when used on proper voltage, stamped on name plate of each heater. Guaranteed free from all electrical and mechanical defects for one year.

Furnished for all voltages, A. C. or D. C. Kindly state voltage when writing for information.

International Electric Co.
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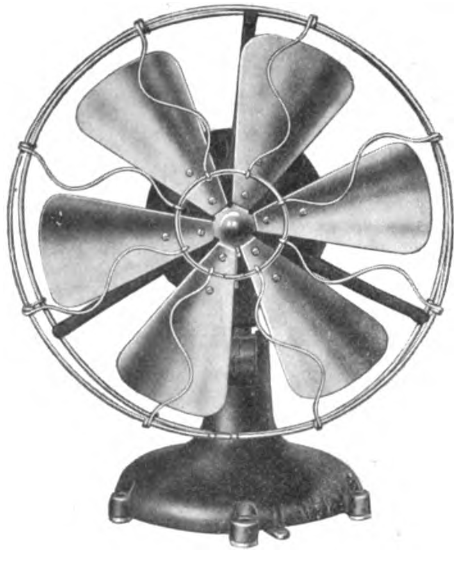
Durable "Dayton" Fans



will **Boost** your business this spring and summer, because they have features, and talking points unlike any other.

Durable "Daytons" placed beside any other show instantly the good points, that are appreciated by the consumer.

Handle something different—not the same as your competitors have to offer.

Made only by

THE DAYTON FAN & MOTOR CO.

Bayonne Street, Dayton, Ohio.

"KNAPP" FANS

Moderate-Priced High-Grade Fans that are big sellers.

110-Volt A. C. or D. C., and Battery Models.

You all know what the "Knapp" products are!

"Knapp" 10" Fans are rigidly built, light weight, adjustable, and have two-speed starting switch. The most-for-the-money fan on the market.

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"Knapp" Utilities Motors—One of our best sellers. It can be put to hundreds of uses, such as polishing silver, sharpening knives, etc. A flexible shaft can be attached for a buff wheel. Furnished with all polishing accessories, emery wheel, etc.

Our catalog is yours for the asking. Ask for it today.

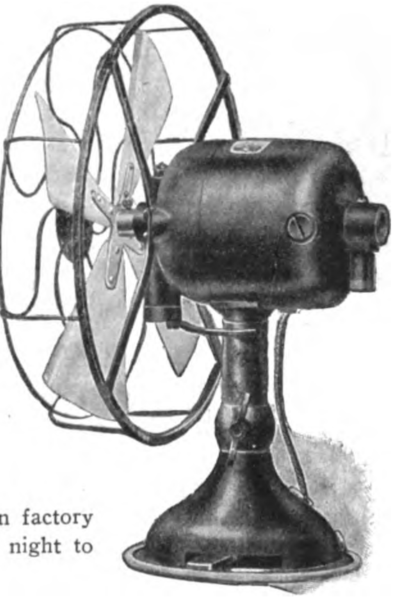
Knapp Electric & Novelty Co.

509 West 51st St.
New York, N. Y.

It is time to stock

DIEHL FANS

now.



Diehl 8" Oscillating Fan
"The Fan for The Home"

You will then have them to sell when the weather is hot and people are clamoring for a breath of air and electric fans.

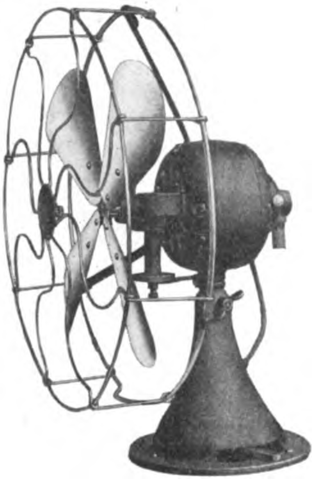
Our specialized fan factory is working day and night to fill orders.

The experience of twenty-six years of fan manufacture is in every Diehl Fan built.

Send now for dealer's catalog, prices and dealer's sales helps.

Diehl Manufacturing Co., Elizabeth, N. J.

BRANCHES
New York, Chicago, Boston, Phila., Washington, D. C.



NO JERKY OSCILLATIONS

with this FAN

When you sell a customer an oscillating fan, show how the oscillator works and tell him what a fine attachment the oscillator is; it's a mighty provoking thing for the oscillator to buck, balk, stick, bind and go on strike generally after the customer gets it. This means complaints, "comebacks," loss. There's nothing like that if it's a

PEERLESS FAN

Oscillator has phosphor bronze gears and hardened steel worm

Model OSS-1 and OSS-2 12 and 16 inch D. C. Oscillating Desk Type.

It's positive in action, resists wear and absolutely obviates jerky oscillations. It works—works right—keeps on working.

So does the fan.

—and it's a handsome fan too.

These characteristics make Peerless Fans a paying line to push. Write for 1915 bulletin.

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- Electric Tops.
- Shock Coils.

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- "Little Hustler" Switch Engines.
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- Hand Driven Dynamos.
- Motor and Countershaft.
- Electric Questioner.
- Shock Coils.

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- Automobiles.
- Cars and Trains.
- Locomotives.
- Switch Engines.
- Motor and Countershaft.

McCANDLESS & CO., H. W., 67 Park pl., New York.
- Scarf Pin.

MANHATTAN ELECTRICAL SUPPLY CO., 17 Park pl., New York.
- Electric Engine.
- "Mesco" Battery Motors.
- Dynamo.

RITTENHOUSE CO., A. E., Honeoye Falls, N. Y.
- "Aerco" Aeroplane.

MENOMINEE ELEC. MFG. CO., Menominee, Mich.
- Motors.

ROSEN & CO., A. W., 610 Broadway, New York, N. Y.
- Flashlight Canes.

STANLEY & PATTERSON, 23 Murray st., New York, N. Y., ("Matchless" Scarf Pin).

Bing, John, New York, N. Y.
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- Locomotives—Automobiles.

Champion Elec. Mfg. Co., New York.
- Motors.

Dilg Mfg. & Trading Co., New York.
- Motors.

H. K. Elec. Toy Co., Indianapolis.
- Aerial Swings—Ferris Wheels.
- Merry-Go-Rounds—Motors.

Ives Mfg. Corp., Bridgeport. Conn.
- Cars and Trains—Switch Engines.
- Locomotives—Battery Motors.

Osborn Mfg. Co., J. K., Harrison, N. J., "Elektoy" Cars and Trains.
- Locomotives—Switch Engines.

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- Hand Driven Dynamo.
- Shock Coil.

Universal Novelty Co., New York, N. Y. (Magic Lantern).
- Battery Motors—Cars and Railways—Locomotives.

Victor Elec. & Stamping Co., Cleveland, O., Battery Motors—Cars and Railways—Locomotives.

Voltamp Elec. Mfg. Co., Baltimore.
- Battery Motors.

Weeden Mfg. Co., New Bedford, Mass.
- Motors.

White Co., H. C., No. Bennington, Vt., Radiopticon Picture Projector.

Willard & Crawford Co., Minneapolis, Min. (Post Card Projectors).

TRAILER CONNECTORS.
See Connectors, Trailer.

TRAINS, TOY.—See Toys.

TRANSFORMER, CUT-OUTS.
See Cut-Outs. Transformer.

TRANSFORMER TOWERS.
See Towers, Steel.

TRANSFORMERS, High Voltage.

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CAMPBELL ELEC. CO., Lynn, Mass. (X-Ray and Ozonizers).

CONDIT ELECTRICAL MFG CO., Boston, Mass. (Series).

CROCKER-WHEELER CO., Ampere, N. J., "Remek."

DUNCAN ELECTRIC MFG. CO., Lafayette, Ind.

FORT WAYNE ELECTRIC WORKS OF GENERAL ELEC. CO., 1612 Broadway, Fort Wayne, Ind.

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8" Universal Table or Desk Fan

8" & 12" Universal Straight and Osc.

TWO WINNERS
Patented
Manufactured by us exclusively

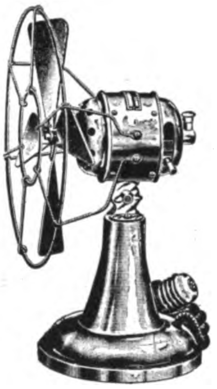
MENOMINEE

Consider the advantages of these new types. The table fan is the only fan made for table or desk use. Hotels, restaurants, home dining rooms all will need our table fan. White or black finish.

The 12" Universal is also a new type though a long felt want. We built the first 8" Universal, now the 12", straight or oscillating.

A Complete Line
Bulletin 114 upon request

MENOMINEE ELECTRIC MFG. CO.
22 years experience
MENOMINEE, MICH.



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Retail Price Only $6.50

A powerful 8-inch Universal Desk-bracket Fan. Gives strong breeze. Wing nut adjustment allows fan to be turned at any different angle up or down. Finished in either nickel or oxidized copper.

White Cross Electric Table Fan No. 289

Retail Price Only $7.00

Most attractive ornamental fan on the market. A rapid seller. In use by the best Hotels and Cafes. Every family a prospective customer. Finished in bright nickel and brass. Fully guaranteed.

Send for a sample today. Return at our expense if Fans and Discount are not to your entire satisfaction. Send for our Catalog No. 68.

Let us know your requirements for the Season early, as our out-put is limited.

LINDSTROM, SMITH COMPANY
Manufacturers of "Guaranteed Electrical Specialties"
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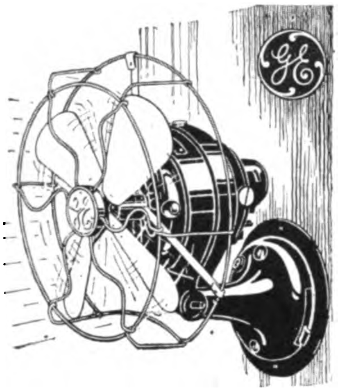
RELIABLE G-E WIRING DEVICES

Southern Electric Co.
BALTIMORE, MD.

Jobbers Electrical Merchandise



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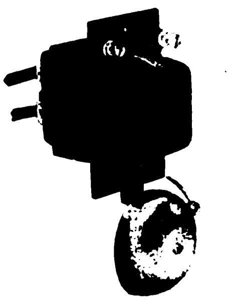
and can handle your orders promptly and satisfactorily.



Type "S B"

BELL RINGING TRANSFORMER

Fits STANDARD FLUSH SWITCH BOX

and takes any standard Iron Box Bell. May also be mounted on surface in regular way. List price, $2.50.

Approved by Underwriters

A. E. RITTENHOUSE CO.
HONEOYE FALLS, N. Y.

Sell Fans with a 5-year Factory Guarantee

Sell Emerson Fans

Desk fans and oscillators complete with 10-foot cords and plugs—For A.C.&D.C.

Induction Ceiling Fans.

Large Stocks—Prompt Shipments.

The Emerson Electric Mfg. Co.

2032 Washington Avenue
ST. LOUIS, MO.

50 Church Street
NEW YORK CITY

The average family does not employ "help" and it is to them that labor saving devices are most important. One of the most necessary in the elimination of domestic drudgery is

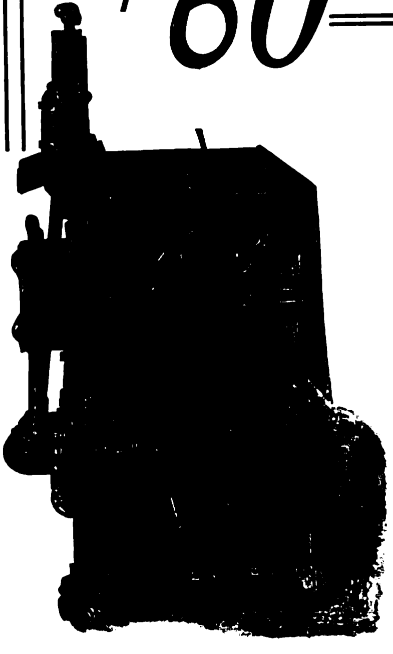
THE Thor ELECTRIC JUNIOR WASHER

It is especially built for family use being small, compact and convenient and priced at a figure within the purchasing power of all.

It is a cylinder type machine, beautifully enameled and built so that there are no exposed parts to injure the user. The wringer which is part of the equipment is also protected.

$60.00

Discounts and full information sent upon request



Hurley Machine Company

37 So. Clinton St.,
CHICAGO

NEW YORK
147 West 42nd St.

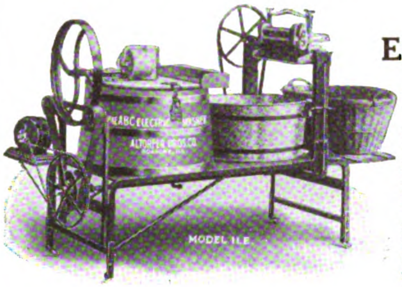
BOSTON
Pettingill-Andrews Co.,
New England Distributers

Sell the Line that Sells Best

The A B C is the easiest line of Power Washers to sell, because most widely and favorably known. A style and price to suit everyone. Complete satisfaction guaranteed—no "come-backs" or adjustments.

The A B C Line Practically sells itself. No extra help or large floor space required. This is an ideal profit-making line that fits in with any Hardware, Implement, or House Furnishing Goods Store, or Department.

A B C
Line of Power Washers

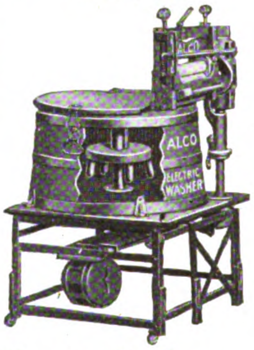


A B C Electric Washer

Original Platform Type Power Washer. Still a great favorite. All-Steel Frame; Adjustable Height Platform. Made for one or two Rinse Tubs. Also with two separate, distinct Wash Tubs for larger requirements. No exposed mechanism. Operated by Gasoline Engine, or *any* convenient power.

Alco Electric Washer

The leading Washer of its type. No mechanism on lid. Requires small space. Four Position, Swinging Electric Wringer. All-Steel Base. Adjustable Height Platform. Extension Platform for Rinse Tub. Ball Bearings.



Liberty Bell Electric Washer

Stave Leg Type of Power Washer. New simple, approved principle of construction. Three Position, Swinging Electric Wringer. Sliding Automatic Dolly. No exposed mechanism.

Progress Electric Washer

Three Position, Swinging Power Wringer. All-Steel Frame. Adjustable Height Platform. Extension Platform for Rinse Tub. No exposed gears. Operated by Gasoline Engine, or *any* power.

Our National Magazine and Agricultural Paper Advertising is pulling an increasing number of inquiries. *Every inquiry from your territory is referred to you.* Local "Selling Helps" such as Illustrated Circulars, Lantern Slides, Electros, etc., furnished FREE. "A B C Co-operation is the Life of Your Trade".

Most *compact* Platform Type Washer

Write today for full information, and SPECIAL PROPOSITION TO YOU.

Altorfer Bros. Company

Factories at Roanoke, and Peoria, Ill.
Executive Offices: Dept. 906, Roanoke, Ill.

Northwestern Electric Co.
New York City
NEW YORK DISTRIBUTORS

WAGNER ELECTRIC MFG. CO., St. Louis, Mo.
WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa.

Adams-Bagnall Elec. Co., Cleveland.
Allis-Chalmers Mfg. Co., Milwaukee, Wis., "Bullock."
Enterprise Elec. Co., Warren, O., "Peerless."
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Triumph Electric Co., Cincinnati, O.
Vindex Electric Co., Aurora, Ill.

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GENERAL ELEC. CO., Schenectady, N. Y.
WAGNER ELEC. MFG. CO., St. Louis, Mo.
WESTINGHOUSE ELEC. & MFG. CO., East Pittsburgh, Pa.
WESTON ELEC'L INSTRUMENT CO., Newark, N. J.

TRANSFORMERS, Low Voltage.

Wireless — Moving Picture — Bell Ringing—Toy—Tungsten Economizing for Transformers for Electro Therapeutical Purposes. See Electro Therapeutical Apparatus.

AMERICAN TRANSFORMER CO., Newark, N. J.
CAMPBELL ELECTRIC CO., Lynn, Mass. ("Lowvolt" for Tungsten Lamps, Bell Ringers and Welding), "Sample."
CONNECTICUT TELE. & ELEC. CO., Meriden, Conn.
DONGAN ELECTRIC MFG. CO., 745 Franklin st., Detroit, Mich., "Junior" (Bell Ringing and Toy).
EDWARDS & CO., New York, N. Y., "Dixie," "Cadet."
FORT WAYNE ELECTRIC WORKS OF GENERAL ELEC. CO., 1612 Broadway, Fort Wayne, Ind., "Wayne."
GENERAL ELECTRIC CO., Schenectady, N. Y.
JEFFERSON ELEC. MFG. CO., 849 W. Harrison st., Chicago, Ill., "Junior."
KUHLMAN ELECTRIC CO., Elkhart, Ind.
LIEBEL MFG. CO., 1002 Hill st., Cincinnati, O.
LIONEL MFG. CO., 48 E. 21st st., New York, N. Y.
MOHAWK ELEC. MFG. CO., Newark, N. J., "Rollinson."
MOLONEY ELECTRIC CO., St. Louis, Mo.
PACKARD ELECTRIC CO., 520 Dana ave., Warren, O. ("A. W." Mazda Regulator for Street Lighting and "Belle" Bell Ringing Transformers).
RITTENHOUSE CO., A. E., Honeoye Falls, N. Y.
U. S. E. M. CO., 221 W. 33rd st., New York, N. Y. ("Potentiostat," D. C.).
VIKING ELECTRIC CO., 154 Chambers st., New York, N. Y.
WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa.

Ashbrook, J. F., Chicago, Ill., "Johns."
Electric Mfg. Co., Baltimore, Md., "Temco."
Empire Transformer Co., Chicago, Ill.
Enterprise Elec. Co., Warren, O., "Peerless."
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Goldberg Ozone Mach Co., Indianapolis, Ind.
Haas Elec. & Mfg. Co., Springfield, Ill., "Adams."
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Pittsburgh (Pa.) Transformer Co.
Reppell Elec. Co., Kansas City, Mo.
Thordarson Elec. Mfg. Co., Chicago, Ill., "Junior."
Victor Elec. Co., Chicago, Ill.
Vindex Elec. Co., Aurora, Ill.
Warner Lamp Co., Davenport, Ia.
Western Transformer Co., East Oakland, Cal.
Winger Elec. & Mfg. Co., Chicago.

TRANSITE, Switchboard Material.

Johns-Manville Co., H. W., New York.

TRANSMISSION TOWERS.

See Towers, Steel.

TREADS, Floor.

Floor Treads and Pushes.

ANSONIA ELECTRICAL CO., Ansonia, Conn., "Daisy."
EDWARDS & CO., New York, N. Y., "Dixie."
LOVELL & CO., H. F., Arlington, N. J., "Double Eagle."
MANHATTAN ELECTRICAL SUPPLY CO., 17 Park pl., New York.
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THE NEW TIPLESS NITROGEN FILLED AUTOMOBILE LAMP

LAMPS OF QUALITY

MADE IN ALL SIZES

MADE IN U. S. A.

We are the only manufacturers of the tipless Nitrogen lamp. Write for prices and agency proposition.

VOSBURGH MINIATURE LAMP CO.
287 Valley Road, WEST ORANGE, N. J.

The Schwarze
Cyclone Bell

No. 6 D. C. and No. 7 A. C., being otherwise similar. This is in every sense a high grade Bell. It responds instantly, and stops as quickly, making it an ideal signalling bell. It is the loudest vibrating bell in existence. For Fire Alarm Companies, Factories and other uses where an absolutely dependable and loud toned bell is required, the "CYCLONE" answers every requirement.

No. 7 A. C. Bell

Built in sizes from six to twelve inches. The Schwarze guarantee of superior design and construction covers our complete line of Bells, and it should offer a strong inducement to you and your trade.

Ask for our descriptive catalog.

The Schwarze Electric Co.
Adrian Mich.

Eastern Representatives:
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Electrical Sales Co.,
114 Liberty St., New York.

ENDURANCE

Eclipse Bell
Cover removed

This is the large
ECLIPSE BELL

It is a low priced bell but not a cheap bell. It is the best value we have ever seen for the money.
In an endurance test just completed one of these bells operated 504 hours continuously with only one adjustment of the contacts.
The hammers do not break off, the contact springs do not break, and there is no wear on any part except the point in contact screw.
Note that these large bells may be assorted with small iron box bells to get you the quantity price.

P R Manufacturing Company
621-659 BELLEVUE AVE. DETROIT, MICH.

CANDELABRA LAMPS

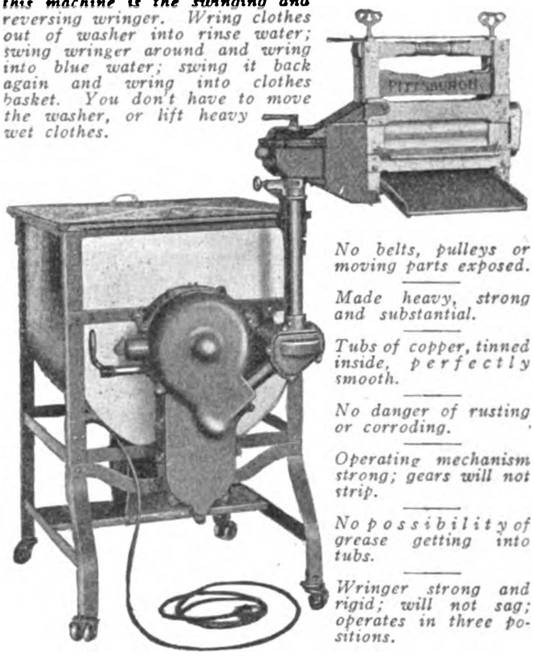
TUNGSTEN
AND
CARBON
IN ALL STYLES

Quality Superior! Prices Excellent!
Delivery: Prompt, Efficient.

MANUFACTURERS
HERZOG & DEMMERLE
42 East 23rd Street NEW YORK CITY

Your Chance

To get the sale of this new Washer and Wringer in your town. It is now ready for the market and offers agents and dealers a fine opportunity for quick sales and good profits.



One of the best features of this machine is the swinging and reversing wringer. Wring clothes out of washer into rinse water; swing wringer around and wring into blue water; swing it back again and wring into clothes basket. You don't have to move the washer, or lift heavy wet clothes.

No belts, pulleys or moving parts exposed.

Made heavy, strong and substantial.

Tubs of copper, tinned inside, perfectly smooth.

No danger of rusting or corroding.

Operating mechanism strong; gears will not strip.

No possibility of grease getting into tubs.

Wringer strong and rigid; will not sag; operates in three positions.

The "Pittsburgh Electric" Washer & Wringer

The "Pittsburgh Electric" is making a hit everywhere it is shown and you should take steps now to insure getting the cream of the business in your territory.

These machines don't cause you any trouble after they are sold. They are made strong and substantial—nothing to get out of order—and you don't have to spend all your profit fixing them up.

Each machine stays sold and helps sell another.

There is valuable territory still open. Write us today for full particulars.

Pittsburgh Gage & Supply Co.
MANUFACTURERS
PITTSBURGH, PA.

"PRESTO" Specialties Mean Larger Profits

The "Presto" line is farther advanced than any other line. More sales—larger sales—more profits—larger profits. These are the results that come with the handling of up-to-the-mark "Presto" Specialties.

The Lamp of a Thousand Uses

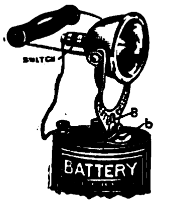
Absolutely safe—does away with kerosene, grease, dangerous gasoline and carbide. Burns continuously or intermittently.

The "PRESTO" Electric Two Cell Hand Lamp

has a *revolving head* which throws a strong, powerful, white light in any direction. Others will not do this. Instantly turned on or off. Has 3 volt bulb and two ordinary No. 6 Dry Batteries. Comes in black enameled case 7 in. high.

No. 1040—"Presto" Electric Two Cell Hand Lamp—no batteries—$1.75.

Lower Priced "PRESTO" Electric Hand Lamps



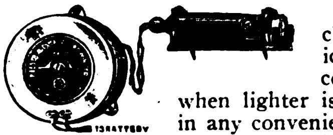
Have revolving heads which throw light in any direction, a feature of all "Presto" Hand Lamps. Serviceable and durable. Nothing to get out of repair. Wind and weather proof. Have many uses. Always ready. Do away with disagreeable odors and dangerous matches, gasoline, kerosene, heat and smoke. Very convenient. Absolutely guaranteed.

No. 1000—"Presto" Electric Hand Lamp—no battery $1.00

Our No. 1020 "Presto" Electric Hand Lamp is unusually efficient. Unlike others, searchlight reflector can be moved to any angle. Everybody needs one for daily use everywhere.

No. 1020—With screw top black enameled metall container—no battery $1.25
No. 1020—With battery 1.55

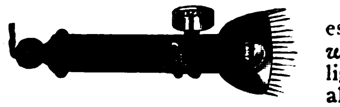
The "PRESTO" Automatic Cord Winder



In great demand among all classes of motorists. Automatically and instantly winds up the cord on "Presto" Cigar Lighters when lighter is not in use. Can be fastened in any convenient place on the car and always be within reach, yet is never in the way. Has attractive appearance. An especially desirable article.

No. 252—Cord Winder and Cigar Lighter, complete with holder..$5.00
No. 240—Cord Winder only........ 2.50
No. 202—Cigar Lighter only with holder........ 2.50

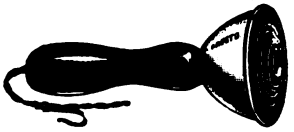
Use the "PRESTO" Electric Cigar Lighter for Three Purposes



Light your cigar in the strongest wind with this *pure platinum wire tipped* lighter. Use it to light your acetylene lamps—it is always ready in any weather. Let it help you in repair work. Uses little current—always handy. No matches—no fire danger. Absolutely safe.

No. 200—Combination complete with holder........ $3.50

Very Useful in Repairing



Has 3-inch brass nickel plated reflector. Gives powerful, penetrating light, adequate for any kind of repair work.

"PRESTO" Inspection and Trouble Lamps

are equipped with ten feet of black cotton cord and adjustable hook hanger.

No. 281—With 6 volt 4 o.p. Tungsten bulb........ $1.00
No. 286—With same bulb and 3 inch Bull's Eye lens........ 1.25

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Eastern Branch
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JOBBERS
Our Proposition Is a Liberal One

RENIM SPECIALTY CO., Brighton Station, Boston, Mass., "Ideal."

Keil & Son, Francis, New York.
Samson Elec. Co., Canton, Mass., "Dandy."

TREE GUARDS. See Conduit, Aerial

TREE INSULATORS.
See Insulators, Tree.

TREE TRIMMERS.
See Trimmers, Tree.

TRIMMINGS, FIXTURE, CAST BRASS—See Fittings, Fixture, Brass.

TRIMMERS, Tree.

OSHKOSH MFG. CO., Oshkosh, Wis.

Atkins & Co., E. C., Indianapolis.
Boyd Mfg. Co., Rockville, Ind.
Klein & Sons, Mathias, Chicago, Ill., "Prunax."
Smith & Son, Oakville, Conn.
Taylor Co., C. M., Paris, Ky.

TROLLEY APPLIANCES.
See Specific Article.

TROLLEYS AND CHAIRS.

(Cable Stringing.)

BISSELL CO., F., Toledo, O., "Security."
CENTRAL TELEPHONE & ELECTRIC CO., 310 N. 11th st., St. Louis, Mo., "Arrow."
FAIRMOUNT ELEC. & MFG. CO., Philadelphia, Pa.
MATTHEWS & BRO., W. N., 3705 Forest Park blvd., St. Louis, Mo.

TROLLEY LINE MATERIAL

Line—Strain—Section—Bell Insulators—Turn Buckles—Crosses—Frogs—Suspensions—Ears.

BARNES & KOBERT MFG. CO., Milldale, Conn. ("B. & K." Strain Insulators).

DICKINSON MFG. CO., Springfield, Mass.

ELECTRIC RAILWAY EQUIPMENT CO., Cincinnati, O.

GARTON CO., W. R., 15 So. Desplaines st., Chicago, Ill.

GENERAL ELECTRIC CO., Schenectady, N. Y.

LOVERING CO., C. P., East Cambridge, Mass. (Strain Insulators).

MACALLEN CO., Macallen and Foundry sts., Boston, Mass.

ST. LOUIS MALLEABLE CASTING Co., 7777 N. Conduit ave., St. Louis, Mo. (Wood Break Strain Insulator Ears, Frogs, Crossings).

WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa.

Anderson Mfg. Co., Albert & J. M., Boston, Mass., "Aetna."
Chester Ry. Supply Co., Chester, Pa., "Dyer."
Creaghead Engng. Co., Cincinnati, O. ("Bourbon" Strain Insulator).
Drew Elec. & Mfg. Co., Indianapolis, Ind., "Samson."
Electric Service Supplies Co., Philadelphia, Pa., "Keystone."
Electrose Mfg. Co., Brooklyn, N. Y., "Arcover."
Eureka Co., North East, Pa.
Gilbert & Sons Brass Fdy. Co., St. Louis, Mo. (Ears).
Johns-Manville Co., H. W., New York
Moore-Jones Brass & Metal Co., St. Louis, Mo.
Naugatuck Malleable Iron Wks., Naugatuck, Conn., "Beardsley."
Newark (N. J.) Engineering Mfg. Co.
Ohio Brass Co., Mansfield, Ohio "Dirigo."
Phila. Elec. & Mfg. Co., Phila., Pa.
White Co., T. C., St. Louis, Mo. (Suspension Insulators).

TROUBLE FINDERS .
See Instruments, Testing.

TROUBLE LAMPS.
See Lamps, Trouble.

TRUCKS, ARMATURE.
See Machines, Armature.

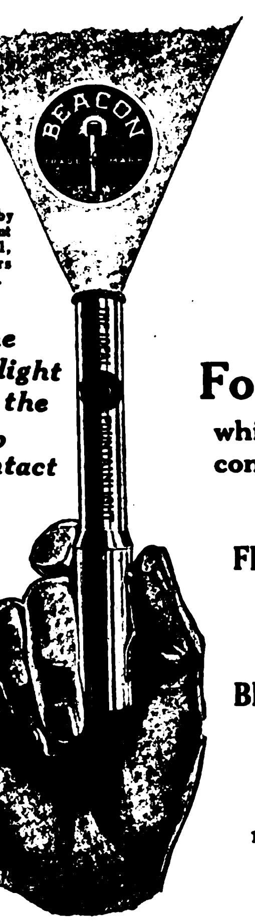
TRUCKS—See Automobiles.

TUBE BENDERS.
See Benders, Tubing.

TUBE CUTTERS. — See Cutters, Carbon and Porcelain; also Machines, Pipe Cutting; also Stocks, Dies, Reamers.

TUBES, PAPER.—See Sleeves.

TUBES, PORCELAIN.
See Porcelain.



Protected by U. S. Patent Nos. 1, 111, 546. Others pending.

The Flashlight with the Clip Contact

Beware of a Cheap Imitation

There is only one

IDEAL

Fountainlight

which cannot make contact in the pocket.

Only one of the BEACON Products of quality in

Flashlights, Batteries, and Bulbs,

BEACON MINIATURE ELECTRIC CO.

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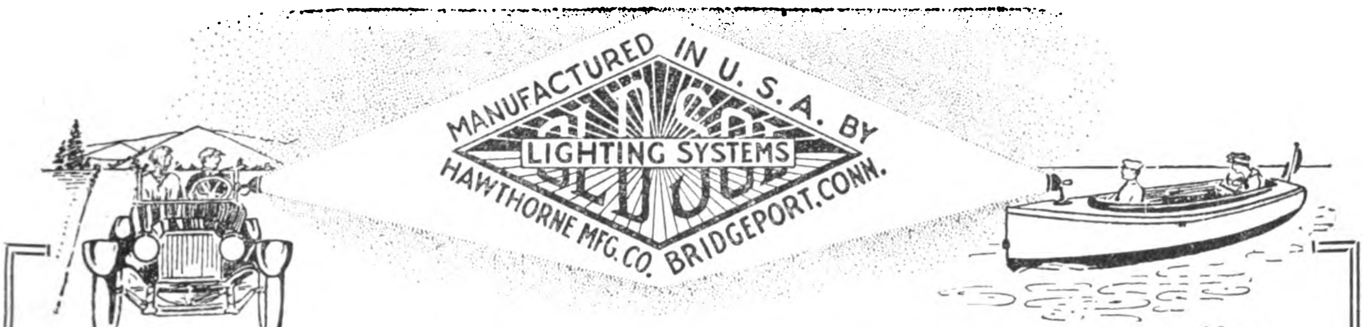
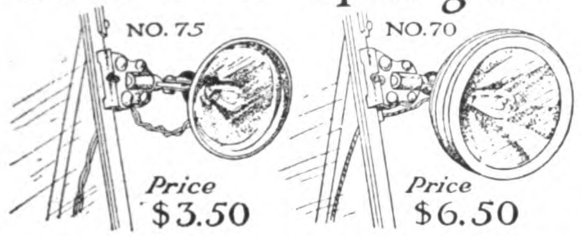

MANUFACTURED IN U. S. A. BY
OLD SOL
LIGHTING SYSTEMS
HAWTHORNE MFG. CO. BRIDGEPORT, CONN.

OLD SOL Spotlights



THE OLD SOL Spotlight, placed conveniently so that it can be turned at any angle—front, back and sideways—is an added comfort and safety in automobiling.

The OLD SOL No. 75 model is admirably adapted for use on Ford and other light cars. No. 70 makes a handsome addition to the equipment of any automobile. Can be quickly detached and used as a trouble light.

The OLD SOL Marine Searchlight is to the motor boat the same relative importance as is the searchlight to the battleship. Equipped with port and starboard signals. Dealers tell us there is a constantly increasing demand. Models No. 70 and No. 75 also adapted for marine service by addition of deck base support for bracket, $1.00 extra.

Useful for picking up the buoy, docking, telegraphing (there is a regular code) and for hundreds of other uses where a Safety First Lamp is wanted.

The OLD SOL Pencil Flashlight is more than a pleasing novelty. Every man, no matter what his vocation, should have one. For detectives, reporters, doctors, nurses, they are indispensable.

OLD SOL Pencil Flashlights are selling by the thousands. Ask your dealer.

Sold by Hardware, Electrical, Drug and Novelty Merchants.

Send for Old Sol 1915 Catalogue

Pacific Coast Representatives—Bailey-Drake Company 604 Mission St., San Francisco, Cal.

HAWTHORNE MANUFACTURING CO., Inc., 9 Spruce Street, BRIDGEPORT, CONN.

MARINE Searchlamp

FLASHLIGHTS

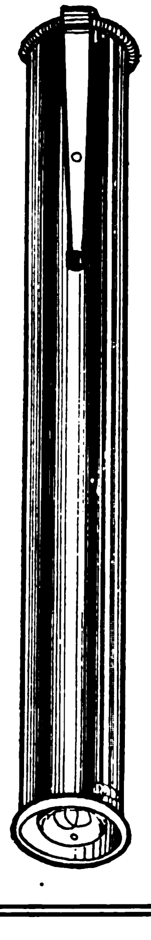
We are manufacturers of first quality flashlights.

We make only the best, and guarantee our goods, in every way, selling the jobbing trade only.

Our facilities are such that we are prepared to accept orders of any quantity, and give satisfactory service.

PROVIDENCE ELECTRIC MFG. CO.
PROVIDENCE, R. I.

STIK-O-LITE
PATENT PENDING



The thinnest, simplest and most efficient pencil-like flashlight in the market.

For use with standard size battery.

Your customers will want a

STIK-O-LITE
PATENT PENDING

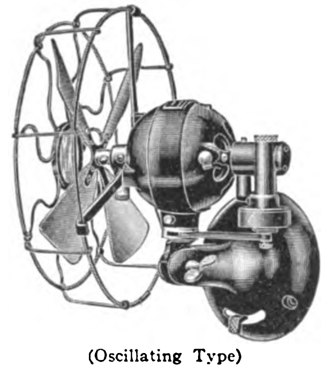
in their pocket—you can put one there for less than a dollar.

Your sample is waiting for you—ask for it.

Our proposition is the best that has been offered to jobbers this year.

Import Sales Company
19 E. 21st St. New York

MESCO



FANS

Direct Current
for
110 and 220 Volt
Circuits

(Oscillating Type)

MESCO Jr. ADJUSTABLE FAN MOTORS

8 inch

Our 8 in. fan is recommended for use in telephone booths, small offices or where a very powerful current of air is not wanted. Three speeds.

MESCO D. C. ADJUSTABLE FAN MOTORS

12 inch—16 inch

Our 12 in. and 16 in. Adjustable Fans are recommended for every situation requiring large volume breeze. They are practically noiseless in operation, do not get overheated, can be tilted to any angle, have three speeds and current consumption is low.

MESCO D. C. OSCILLATING FAN MOTORS

12 inch—16 inch

Our 12 in. and 16 in. Oscillating Fans embody the same good qualities of our standard fan with the oscillating feature added. Can be adjusted so as not to oscillate if desired. Mechanism entirely enclosed.

All guards and fan blades highly polished and lacquered. Motor and base finished in black enamel. GUARANTEED TO BE mechanically and electrically perfect.

Ask for Booklet with detailed description.

Manhattan Electrical Supply Co.

New York, 17 Park Place
Chicago, 114 S. 5th Ave.
St. Louis, 1106 Pine St.
San Francisco, 604 Mission St.

Factories: Jersey City, Cincinnati, Ravenna, O.

TUBES, Speaking.

MANHATTAN ELECTRICAL SUPPLY CO., 17 Park pl., New York.
OSTRANDER CO., W. R., 22 Dey st., New York, N. Y.
POOLE, JAMES W., 16 Columbia st., Boston, Mass.
WILHELM, H., 70 Frost st., Brooklyn, N. Y.

Dieckmann Co., F., Cincinnati, O.
Keil & Son, Francis, New York.
Lamb & Ritchie Co., Cambridgeport, Mass.

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(Brazed, for Fixtures.)

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Benedict & Burnham Mfg. Co., Waterbury, Conn.
Bridgeport (Conn.) Brass Co.
Coe Brass Mfg. Co., Torrington, Ct.
Ivins Tube Wks., Philadelphia, Pa.
National Brass & Copper Tube Co., New York, N. Y.
New Jersey Tube Co., Harrison, N. J.
Randolph Clowes Co., Waterbury, Ct.
Roberts Tube Wks., Detroit, Mich.
Rome (N. Y.) Brass & Copper Co.
Rome Hollow Wire & Tube Co., Rome, N. Y.
United Wire & Supply Co., Providence, R. I.
Wells Co., A. H., Waterbury, Conn.

TUBING, FIBRE. See Fibre.

TUBING, Flexible Fabric.

BOSTON WOVEN HOSE & RUBBER CO., Dept. No. 50, Cambridge, Mass.

Atlantic Tubing Co. Providence, R. I.
Boston Insulating Co., Elmira, N. Y. (Paper Fibre, Cotton Stitched).
New York Belting & Packing Co., New York, N. Y.
New York Gas Tubing Co., New York.

TUBING, Flexible Metallic.

Almond Mfg. Co., T. R., Ashburnham, Mass.
American Metal Hose Co., New York.
Atlanta Metal Hose Co., New York.
Breeze Carbureter Co., Newark, N. J.
Flexible Arms for Portables.
Lombardi Motor Co., Derby, Conn.
National Chain Co., New York.
N. Y. Flexible Metallic Hose & Tubing Co., New York, N. Y.
U. S. Flexible Metallic Tubing Co., Los Angeles, Cal.

TUNGSTEN ADAPTERS.
See Adapters, Lamp.

TUNGSTEN BOXES AND WRAPPERS.—See Boxes and Wrappers.

TURBINES, Steam.

GENERAL ELECTRIC CO., Schenectady, N. Y.

TURBINES, Water.

LEFFEL & CO., JAMES, 336 Lagonda st., Springfield, O., "Samson."

TURNTABLES, Showcases.

Green Elec. Co., W., New York.
Pearce Co., Frederick, New York.

UNITS, RODS AND GRIDS

Resistance.

CUTLER-HAMMER MFG. CO., Milwaukee, Wis.
DIXON CRUCIBLE CO., JOSEPH, Jersey City, N. J.
WALDMAN, JOHN J., 136 Liberty st., New York, N. Y.
WARD LEONARD ELECTRIC CO., Bronxville, N. Y.
WIRT CO., Germantown, Philadelphia, Pa., "Di-El-Ite."

Ellcon Co., New York (Imp.).
Industrial Controller Co., Milwaukee.
Railway & Industrial Engineering Co., Greensburg, Pa., "Koppat" Resistor.

URNS.—See Cooking Utensils.

VACUUM CLEANERS.
See Cleaners, Vacuum.

VACUUM PUMPS.
See Pumps, Vacuum.

VALVES, Steam and Water.

(Electrically Operated.)

CUTLER-HAMMER MFG. CO., Milwaukee, Wis. (Solenoid).

Chapman Valve Mfg. Co., Indian Orchard, Mass.
Coffin Valve Co., Boston, Mass.
Coldwell-Wilcox Co., Newburg, N. Y. (Sluice Gates).
Crane Co., Chicago, Ill.
Nelson Valve Co., Wyndmoor, Pa.
Pittsburgh Valve, Foundry & Construction Co., Pittsburgh, Pa.
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Schutte & Koerting Co., Phila., Pa.

VAPOR LAMPS.—See Lamps, Vapor

VAPORIZERS.—See Perfumers.

SAFETY FIRST!

Yale Electric Lantern

ALWAYS READY FOR INSTANT USE!
Just turn the switch and
get a flood of light!

A BIG SELLER AT A BIG PROFIT!
Retail price $3.50. Sample $2.50

A sample will be sent to responsible jobbers and dealers upon request.

Just the light for AUTOISTS, as a handy trouble light, a safety garage lantern, and indispensable on country trips.

Invaluable for SPORTSMEN, MERCHANTS, DELIVERY MEN, FARMERS, HOUSEHOLDERS, etc. A safety light for CHILDREN and OLD FOLKS. No oil to handle! No matches to light! No danger of fire! No trouble on stormy nights!

Dealers wanted everywhere. Write at once for circular and discounts.

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PRACT-EL-LITE

The Real Practical Electric Light of Unlimited Uses

Any Dry Battery fits the Pract-El-Lite.

Superior quality and best appearance, with right profits to dealer and jobber.

$1.25
without
battery

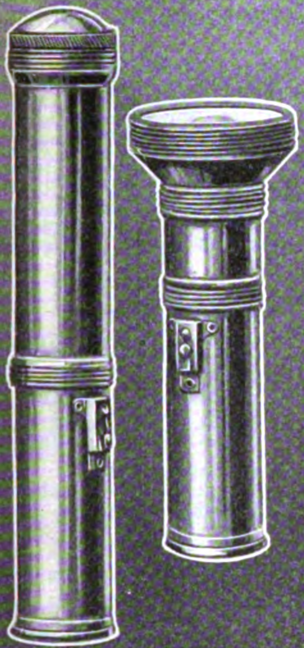
Write us for prices and printed matter
We co-operate with our customers

Central Telephone and Electric Co.
310 N. 11th Street St. Louis, Mo.

Western Representatives
Safety Electric Co., Rialto Bldg., San Francisco, Cal.

Kwik-lite

THE QUALITY FLASHLIGHT



DESIGNED WITH SKILL BUILT BY EXPERTS

It is the line with character—just what you need to build up your business.

Kwiklite products are distinct in design and finish, with many new features not found in other lines.

Skilled workmen make all Kwiklites in our own factory. Every Lamp is a Mazda of great strength and brilliancy, and especially designed for use in Kwiklite Cases. Every Case, every Battery, bears the quality

trade mark Kwik-lite and carries

the guarantee of a responsible concern, hence, thorough satisfaction to your customers and increased business for you.

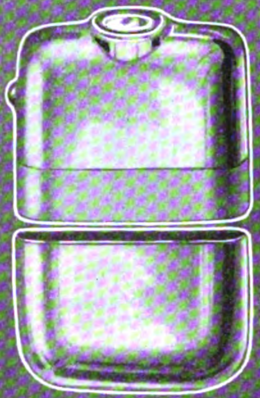
Our prices are right. Your profit liberal.

It will pay you to send for our thirty-two page catalog describing sixty-five different styles and finishes of Cases, together with a complete line of Batteries and Flashlight Lamps.

The Usona Manufacturing Co., Inc.

One Hudson Street
New York City

307 S. St. Clair Street
Toledo, Ohio



"Boy Scout"

SIGNAL FLASHLIGHT

(Made in America)

Approved by the National Headquarters of the Boy Scouts of America.

Price complete $1.10
Dealers 65c

Agents wanted

C. D. WOOD ELECTRIC CO.
136 LIBERTY ST. NEW YORK

The No. 1 shield assortment includes 10 assorted flashlights complete and battery tester and retails at $10. If your jobber does not have it, send us $5. and we will ship you the assortment, prepaid to any address in the U. S.

Let This Counter Display Sell Flashlights for You at 100% Profit

Bright, attractive shield 14½"x15" printed in 3 colors, on best grade cardboard. Strong easel back. ACTUAL FLASHLIGHTS attached with elastic cord, all ready to set up on your counter.

FREE WITH TRIAL ASSORTMENT
ANGLO-AMERICAN
(Fully guaranteed)
FLASHLIGHTS AND BATTERIES

Superior in quality. Most attractively priced.
Sold by the largest jobbers.
Catalog 14 and discounts on request.

ANGLO-AMERICAN CO.
Manufacturers **PITTSBURGH, PA.**

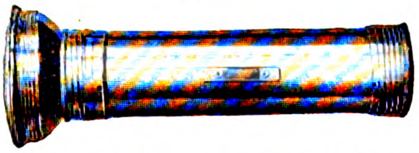
"GOODS WELL DISPLAYED ARE HALF SOLD"

NICKEL PLATED METAL TUBULAR FLASHLIGHTS

Another live production of the FRANCO class that will remain.

Quality FRANCO Products

TRADE MARK



These solid brass, highly nickel plated cases with perfected contact are in full control at all times and cannot be spoken of too highly. A beauty as a flashlight and the demand turns them into big profits. Can best be appreciated by sending in your trial order.

INTERSTATE ELECTRIC NOVELTY CO.

29 Park Place, NEW YORK
CHICAGO SAN FRANCISCO
For Canadian Trade 220 King St. W. Toronto

CLEVELAND'S UNIQUE INDUSTRIAL POSITION AND MANUFACTURING ADVANTAGES

In ten years, between census of 1900 and 1910, Cleveland's factory output more than doubled. In the thirty-three following lines of manufacture it either leads the entire world or takes high rank:

Astronomical Instruments,
Automobiles,
Automobile parts,
Bolts and Nuts,
Carriage hardware,
Castings,
Chemicals,
Cigars,
Drop forgings,
Dry batteries,
Electric carbons,
Electric lamps,
Electric welding,
Hardware,
Hoisting machinery,
Iron and steel,
Knit goods,
Machinery,
Metal stampings,
Oils, paints and varnishes,
Paper boxes,
Printing & Publishing,
Screws,
Sheet metals,
Shipbuilding,
Stoves,
Tacks,
Tools,
Wire,
Wire nails,
Wire fences,
Wire springs,
Women's outer garments.

This is the natural inevitable result of fundamental conditions which favor the Cleveland manufacturer. Chief among these are:

Central Location

Within five hundred miles of Cleveland is more than one-half the total population of the United States and Canada. Cleveland is within one night's ride of the Atlantic Seaboard and the Mississippi River, and is on the principal travel highway between New York and Chicago. Iron ore, copper, stone, lumber, hides, wool, oils and other raw material are brought to Cleveland from nearby sources at low cost of transportation.

Comprehensive Transportation

All the Eastern trunk lines of the United States enter Cleveland, including nine different railroads. Transportation costs to principal markets are light, because of the City's central location and because of water competition. By boat, Cleveland has practically EXPRESS service at freight rates to the principal ports of the Great Lakes, during eight months of the year.

Good Labor Supply

For many years the City has had an excellent supply of high grade labor, at all times. Fewer serious labor troubles have occurred here than in any other large manufacturing center. The great diversity of Cleveland industries and the unusually attractive living conditions are a very favorable factor in the labor situation.

Cheap Power

Cleveland's proximity to immense coal fields of high quality means cheap steam coal. Natural gas, piped from West Virginia, is sold at a very low price for industrial uses. Even with these low fuel costs, electric power from Central Station is still more economical. Electric power rates are so attractive that even the largest users prefer to buy "Illuminating" service to making their own power.

Correspondence is invited with manufacturers desiring a better location, better transportation facilities, better labor conditions, and cheaper power, than they now have. Address Cleveland Chamber of Commerce or

The Cleveland Electric Illuminating Company

"Not merely electric power, but also 'Illuminating' Service"

THERE IS A DIFFERENCE

VARNISH, ARMATURE. — See Paints and Compounds.

VEGETABLE PEELERS.
See Peelers and Parers.

VIBRATORS, ELECTRO THERAPEUTICAL.—See Electro Therapeutical Apparatus.

VIBRATORS, Massage.

LINDSTROM-SMITH CO., 1100 S. Wabash ave., Chicago, Ill., "White-Cross."
MANHATTAN ELECTRICAL SUPPLY CO., 17 Park pl., New York, N. Y., "Premier."
SHELTON ELEC. CO., New York, N. Y.
WISCONSIN ELEC. CO., 1635 Junction ave., Racine, Wis.

Arnold Elec. Co., Racine, Wis.
Barker & Co., James, Philadelphia.
Betz Co., Frank S., Chicago, Ill.
Birtman Electric Co., Chicago, Ill., "Bee."
Chicago (Ill.) Motor & Vibrator Co.
Coates Clipper Mfg. Co., Worcester, Mass., "Joy," "Giggle."
Geier Co., P. A., Cleveland, Ohio, "Royal," "Rex."
Haas Elec. & Mfg. Co., R., Springfield, Ill., "Ideal."
Hamilton-Beach Mfg. Co., Racine, Wis., "Newlife."
Kny-Scheerer Co., New York,
McIntosh Battery & Optical Co., Chicago, Ill.
O'Brien Electrophone Co., Hallowell, Me.
Presto Elec. Co., San Francisco, Cal.
Racine Electric Co., Racine, Wis.
Schunk & Ogg, New York, N. Y., "Fraley."
Siebert-Welch Co., Massillon, O., "Inst."
Stolz Electrophone Co., Chicago, Ill.
Strand & Co., N. A., Chicago, Ill.
Swedish Rhythmic Vibrator Co., Chicago, Ill.
Universal Novelty Co., New York, N. Y., "Vibrosimplex."
Victor Elec. Co., Chicago, Ill.
Vibrassage Co., Chicago, Ill.
Waite & Bartlett Mfg. Co., New York, N. Y.

VISES, Linemen's Pipe.

ARMSTRONG MFG. CO., 322 Knowlton st., Bridgeport, Conn. (Pipe)
WILCOR MFG. CO., 4824 W. Lake st., Chicago, Ill.
Billings & Spencer Co., Hartford.
Dicke Tool Co., Downers Grove, Ill.
Klein & Sons, M., Chicago, Ill.

VENTILATING FANS.—See Fans.

VOLTAGE REGULATORS.
See Regulators, Voltage.

VOLTMETER SWITCHES.
See Switches, Voltmeter.

VOLTMETERS.
See Instruments, Indicating.

VULCANITE—See Rubber.

VULCANIZERS, Electric.

WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa.

Adams Co., Henry T., Chicago, Ill.
Corbett & De Coursey Co., Pittsburgh.
Electric Vulcanizer Co., Minneapolis.
Fearn Co., Baltimore, Md., "Calorel."
Gibney & Bros., James L., Philadelphia, Pa. ("Elek-Trick").
Shaler Co., C. A., Waupun, Wis.

WAFFLE IRONS.—See Cooking.

WAGONS, Tower.

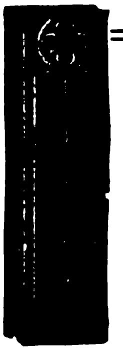
General Vehicle Co., L. I. City, N. Y. (Electric Hurry-up Wagon).
General Motors Truck Co., Pontiac, Mich.
Leonhardt Wagon Mfg. Co., Baltimore, Md.
McCardell & Co., Trenton, N. J.
Milburn Wagon Co., Toledo, O.

WALL BRACKETS.
See Fixtures, Adjustable.

WARMERS, FOOD.—See Cooking.

WARMERS, Foot. (& Rugs)

GENERAL ELECTRIC CO., Schenectady, N. Y.
INTERNATIONAL ELEC. CO., Century Bldg., Indianapolis, Ind.
Butte Engineering & Elec. Co., San Francisco, Cal.
Hotpoint Elec. Htg. Co., Ontario, Cal., "El Warmo."
Reynolds Dull Flasher Co., Chicago.
Rochester Stamping Co., Rochester.
Simplex El. Htg. Co., Cambridge, Mass. (Rugs).
Slaughter Co., Wm. F., Chicago, Ill.



CONNECTICUT

Electric Reset Annunciators

The most sensitive drop.

All drops reset electrically by means of a push button on the annunciator.

The only annunciator which operates successfully with a bell ringing transformer.

CONNECTICUT

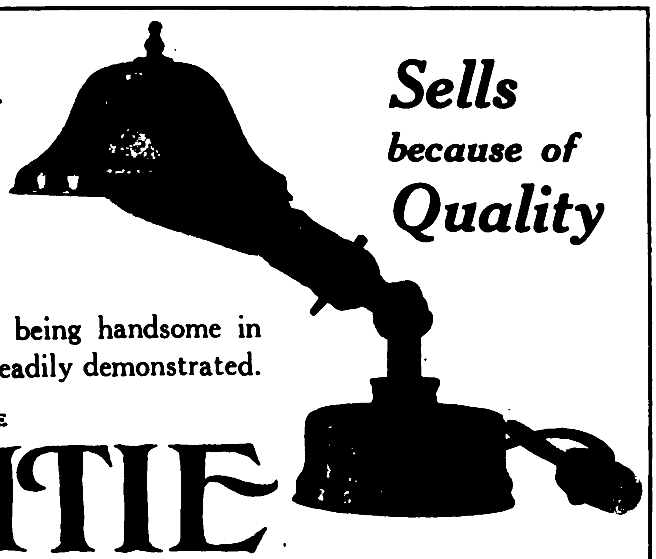
Interior Telephone Systems

An exceptionally complete line of telephones for apartment houses, residences, hotels, hospitals, schools, etc. Prices that allow the dealer an exceptionally good profit. Connecticut quality—best of materials and workmanship.

Write for special dealers' proposition and new Catalog 23 B.

Connecticut Telephone & Electric Company, Inc.
Meriden, Conn., U. S. A.

A Central Station Specialty



Sells because of Quality

The Central Station Sales Manager who is looking for current consuming devices of merit, will find the Vanitie Portable Electric Lamp a desirable acquisition to his stock.

As a window display it is unapproached, being handsome in appearance, and its utility and usefulness readily demonstrated.

THE

VANITIE

Reg. U. S. Pat. Office

Portable Electric Lamp

Is carefully manufactured from the best material, each one being tested before leaving the factory. Central Stations can therefore sell them to their customers without fear of being called upon to do repair work.

The jewelers in your town need direct light, the men who shave themselves need direct light—in fact in home, store or factory direct light is of vital importance.

You can supply it—our proposition is most advantageous and we will send it promptly on request.

Write today for particulars

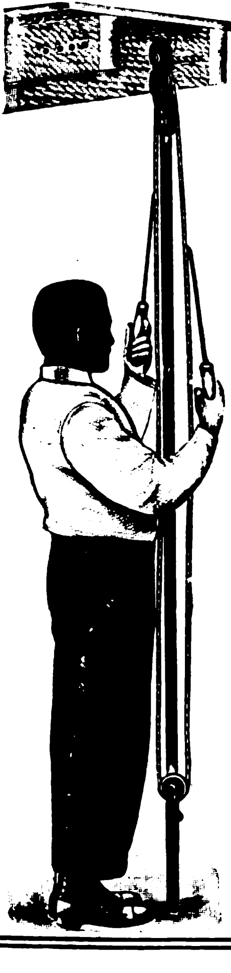
SIMMONS HARDWARE CO.

St. Louis Sioux City Philadelphia
Toledo Wichita Minneapolis

or

ALADDIN LAMP CORPORATION

52 Vanderbilt Ave., Suite 1803
New York City New York



READ THIS

Boston, Mass.,
Feb. 22, 1915

FORD AUGER BIT Co.,
Holyoke, Mass.

Gentlemen.

Kindly send goods as per enclosed card. Let me state that we have used your Double Action Boring Machine for the past few years and find it certainly does the work as you state. We have not spared the Machine in any way and the first Machine we bought is still on the job and has earned its price many times over. We could hardly run our jobs without a Machine and still make time.

Very sincerely yours,
FRED M. DAVIS Co.
By Fred M. Davis.

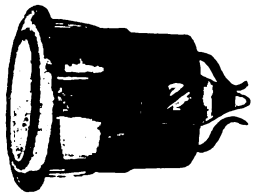
This is but one of many other letters we have received regarding the splendid worth of the

FORD

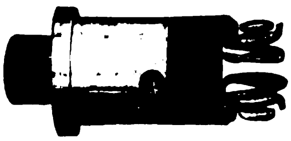
Double Action Boring Machine

If you have any overhead boring whatever to do you cannot afford to overlook the great time and labor saving features this Machine brings home to you. Saves 50% of effort and runs twice as fast as any other Boring Machine. It is patented and there is not another like it. Write for folder describing this splendid tool and other wood working tools manufactured by us. We will send a neat heavy paper pocket wallet with it.

FORD AUGER BIT CO.
Holyoke, Mass.

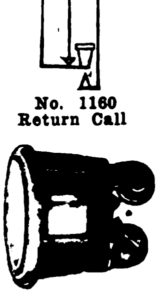


No. 260
3 and 4 Contacts

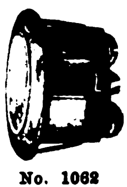


No. 85
110 Volts

No. 1160
Return Call



No. 620
Dixie, Jr., 5/8"



No. 1062
Competitive, 5/8"

1872-1915

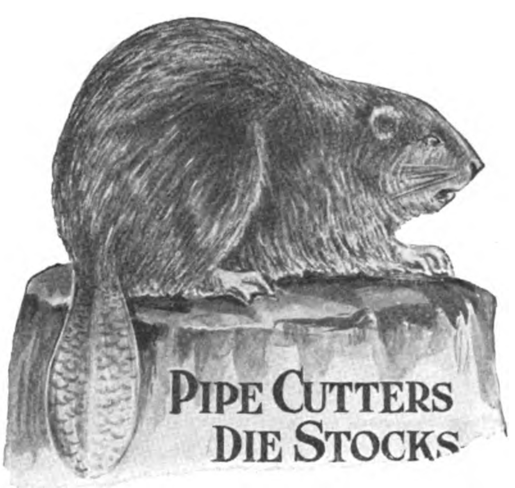
For almost fifty years we have been manufacturing push buttons. This permanency in the face of increasing pressure and competition is due to the superior merit of our products, our policy being *not* to see how cheaply we can manufacture, but how *good*.

The trade is not only handling the Edwards goods at a money profit, but a profit in time also. When our goods are installed, the job is finished. There is no going back to repair defective parts, as all specialties are tested before leaving the factory and have our guarantee of service.

Our New Catalogue containing 300 Illustrations on request.

1872 EDWARDS

EDWARDS & CO., Inc.
NEW YORK



BEAVER TOOLS ARE REVOLUTIONIZING THE CUTTING AND THREADING OF ELECTRICAL CONDUIT

You can prove in your own shop, at our expense, viz.—

Beaver Square End Pipe Cutters cut conduit without a burr, three times faster than hack saws.

Beaver Easy Working Die Stocks will reduce your threading cost. Just drop us a card today, it's up to us to prove it.

Ask for New Catalog 14.

THE BORDEN CO., Warren, Ohio

WARMERS, Milk

See Heaters, Liquid.

WARMERS, Steering Wheel.

Automobile.

Warm Hand Steering Wheel Co., Poughkeepsie, N. Y.

WASHERS, Clothes.

(Motor Driven.)

ALTORFER BROS. CO., Dept. 906, Roanoke and Peoria, Ill., "Alco."

APEX APPLIANCE CO., 3223 West 30th, Chicago, Ill.

HURLEY MACHINE CO., 37 So. Clinton st., Chicago, Ill., "Thor," "Red."

PITTSBURGH GAGE & SUPPLY CO., Pittsburgh, Pa., "Pittsburgh."

WALKER BROS. CO., 225 Walton st., Syracuse, N. Y.

WESTERN ELEC CO., New York, N. Y., "Conlon."

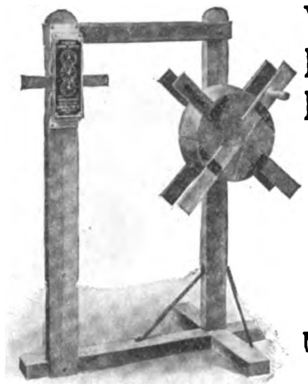
American Washer Co., St. Louis, Mo., "Jewel," "Star," Wamanco."
American Woodenware Mfg. Co., Toledo, O., "Toledo."
Arnold Elec. Co., Racine, Wis.
Arora Co., New York, N. Y.
At Last Washer Co., Perry, Ia.
Automatic El. Washer Co., Newton, Ia.
Barnes Mfg. Co., Susquehanna, Pa.
Bartow & Seelig Mfg. Co., Ripon, Wis., "Big 3."
Beebe Sales Co., Minneapolis, Minn.
Blackstone Mfg. Co., Jamestown, N. Y.
Bluffton Mfg. Co., Bluffton, O.
Boss Washing Mch. Co., Cincinnati.
Branmer Mfg. Co., H. F., Davenport, Ia., "O. K."
Brokaw-Eden Mfg. Co., Chicago, Ill., "Eden."
Coffield Motor Washer Co., Dayton, O.
Chicago Dryer Co., Chicago, Ill.
Cycle Washing Machine Co., Chicago.
Davenport Washing Mach. Co., Davenport, Ia., "Grand."
Dexter Mfg. Co., Fairfield, Ia.
Dodge & Zuill, Syracuse, N. Y., "Easy."
Domestic Equipment Co., Chicago, Ill., "Oscillator."
Easiest Way Mfg. Co., Sandusky, O.
Electric Motor Equipt. Co., Denver.
Fairbanks, Morse & Co., Chicago, Ill., "Eclipse."
Frantz Premier Co., Cleveland, O.
Getz Power Washer Co., Morton, Ill.
Grinnell Washing Machine Co., Grinnell, Ia. ("Elmo," "Big Four," "Lewis" Washer and Wringer).
Haag Bros. Co., Peoria, Ill., "Ideal," "Peoria," "Royal."
Home Washing Machine Co., Brooklyn, N. Y., "Walton."
Horton Mfg. Co., Fort Wayne, Ind.
Imperial Mfg. Co., Sand Springs, Okla. (Washer and Wringer).
Johnson Power Washer Co., San Francisco, Cal.
Judd Laundry Machine Co., Chicago.
Knell, J. H., Reading, Pa., "Queen."
La Crosse (Wis.) Washer Co., "Faultless."
Ledewyck Hydro-Motor Co., Detroit, Mich., "Detroit."
Maytag Co., Newton, Ia.
Meadows Mfg. Co., Pontiac, Ill.
Michigan Washing Mach. Co., Muskegon, Mich., "Electric Lady."
Nat. Laundry Mach. Co., Chicago.
Newport Washer Co., New York.
Newton (Ia.) Washing Machine Co.
Nineteen Hundred Washer Co., Binghamton, N. Y.
One Minute Washer Co., Sandusky, O.
Paragon Mfg. Co., Chicago, Ill.
Rex Mfg. Co., Johnstown, Pa., "King."
Richmond (Va.) Cedar Wks.
Rochester (N. Y.) Rotary Washer Co.
Santo Mfg. Co., Philadelphia, Pa.
Superior Mach. Co., Sterling, Ill.
Thistle Mfg. Co., Chicago, Ill.
Upton Machine Co., St. Joseph, Mich., "Giant."
Victor Mfg. Co., Leavenworth, Kans., "Wonder."
Victor Motor Washing Machine Co., Cincinnati, O.
Voss Bros. Mfg. Co., Davenport, Ia.
Wenzelman Mfg. Co., Galesburg, Ill., "Sani-Copper."
White Lily Mfg. Co., Davenport, Ia.
Wiard Mfg. Co., East Avon, N. Y.

WASHERS, Dish.

(Motor Driven.)

HURLEY MACHINE CO., 37 So. Clinton st., Chicago, Ill., "Thor."
WALKER BROS. CO., 225 Walton st., Syracuse, N. Y.
WESTERN ELEC. CO., New York, N. Y., "Geyser."

Blakeslee & Co., G. S., Chicago, Ill.
Bromley-Merseles Mfg. Co., New York, "Crescent."
Domestic Utilities Co., Newark, N. J., "Nevernick."
Fearless Dishwasher Co., Rochester.
Garis-Cochrane Mfg. Co., Chicago.
Hamilton-Low Co., New York, N. Y., "Vortex."
Insinger Co., Philadelphia, Pa.



WIRE MEASURING MACHINE

A great convenience and time saver. Reels wire into a neat coil and shows number of feet.

Made by

Minneapolis Electric and Construction Co.
Minneapolis, Minn.

The "DREADNAUGHT" GASOLENE TORCH

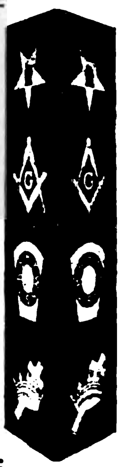
Delivers The Hottest Fire—Withstands The Hardest Knocks—Quick Starting—Long Lived—Non-Leaking.

The "Dreadnaught" is a new and greatly improved torch—the first perfect gasoline torch ever put on the market—does away with all your old torch troubles.

Write for Prices—NOW

P. WALL MFG. SUPPLY CO.
705 Preble Avenue.
Pittsburgh, Pa.

THE R AND E INTERCHANGEABLE
ART ELECTRIC WINDOW SIGN



THIS SIGN COMPELS ATTENTION

Flashing its message in snow-white letters surrounded by a border of Colored Art Glass this sign presents a striking appearance, and is a most attractive advertising device. *Write for complete circular.*

ILLUMINATING COLORED GLASS SIGNS OF EVERY VARIETY

Ruby Exit and Fire Escape Signs carried in stock with and without frames. Lodge Emblems made up promptly on any color of flashed glass. Telephone and telegraph signs in any size. Advise us of your requirements and we will quote prices. *Send for Catalogue Q.*

RAWSON & EVANS CO., 711 Washington Blvd., Chicago, Ill.

H. M. BYLLESBY & COMPANY
ENGINEERS AND MANAGERS

NEW YORK — Trinity Building
CHICAGO — Continental and Commercial Bank Building
TACOMA — Washington

PURCHASE, FINANCE, DESIGN, CONSTRUCT AND OPERATE ELECTRIC LIGHT, GAS, STREET RAILWAY AND WATER POWER PROPERTIES.

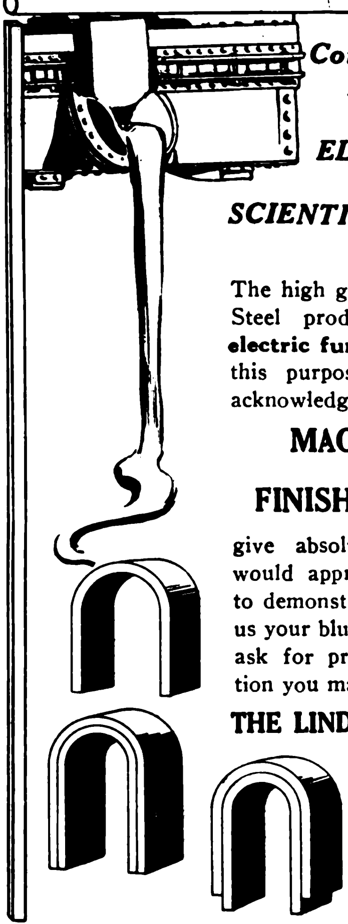
EXAMINATIONS AND REPORTS

UTILITY SECURITIES BOUGHT AND SOLD

For Fishing or Hunting Trips or When Camping

The flashlight Battery should be one that will give long service and can be relied on. For such a Battery give your customers MARS-BRIGHT. Guaranteed.

BRIGHT STAR BATTERY CO.
NEW YORK and CHICAGO



Completely Finished
MAGNETS FOR MAGNETOS ELECTRIC METERS and SCIENTIFIC INSTRUMENTS

The high grade Tungsten Magnet Steel produced by us in our **electric furnaces** is the best for this purpose. It is universally acknowledged that our

MAGNET STEEL
and
FINISHED MAGNETS

give absolute satisfaction. We would appreciate the opportunity to demonstrate this to you. Send us your blue prints or samples and ask for prices and any information you may require.

THE LINDENBERG STEEL CO.

90 West Street
New York City

At Last—A Plaster Drill
for finished house wiring

This new tool fills a long felt want for the contractor.—
It will cut a clean, sharp hole, any size up to 4 inches so that the outlet box fits firmly and snugly.
All falling plaster and shavings are caught in the metal receptacle—so that the job is done absolutely without dirt or muss.—
Will cut anywhere—the thinnest plaster or the thickest center pieces and do it in less than one-third (⅓) the usual time.
Handsomely finished—cutting knives adjustable to any required diameter and drop forged—
This tool will make your workmen popular. It enables them to do a clean, neat job and do it quickly. You can't afford to be without it. Will pay for itself in *time saved* in a very short time.
Price $5.00 complete. Write us for particulars.

AMERICAN PLASTER DRILL CO., Inc.
688 Broadway Brooklyn, N. Y.

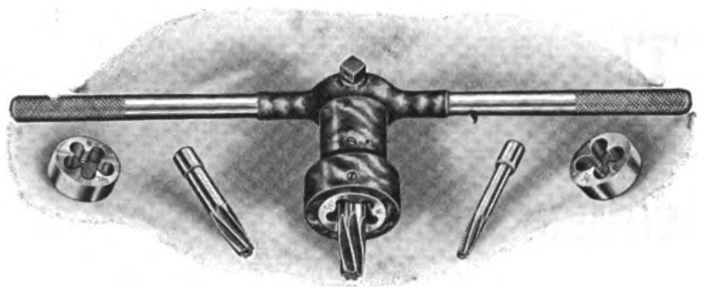
Save Your Knuckles

in threading conduits by using the

Little Giant

Pipe Threading Set
for Ceilings

The Internal Guide is a wonderful help. It reams the inside of the pipe at the same time the thread is being cut. It permits closer work than any other style of stock. Even pipe cut on an angle presents no difficulty in starting a straight thread.



If your dealer cannot supply you, write
WELLS BROTHERS COMPANY, DIV.
GREENFIELD TAP & DIE CORPORATION, Greenfield, Mass.
New York. Chicago Philadelphia London
In Canada, Wells Brothers Co. of Canada, Ltd., Galt, Ontario.

ALLMICA PLATES

Write us for
Special Offer on Plates
It will interest you

Manufactured by the
AMERICAN MICA COMPANY
NEWTON LOWER FALLS, MASS.

MICA FOR ELECTRICAL AND MECHANICAL PURPOSES

INDIA—AMBER—DOMESTIC

Any size, shape, pattern, grade; rough trimmed, rectangular cut, washers, discs, etc. For every use of mica we are prepared to submit samples and prices of qualities best suited to requirements.

EUGENE MUNSELL & CO.
Miners, Importers and Wholesale Dealers
68 Church Street
NEW YORK
542 S. Dearborn Street
CHICAGO

National Machine & Stamping Co., Detroit, Mich.
Santo Mfg. Co., Philadelphia, Pa.

WASHERS, FIBRE—See Fibre.

WASHERS, Leather.

(Nail Insulating.)
EUREKA SUPPLY CO., Sewell, N. J.
Feeser Co., F. S., Indianapolis, Ind.
Hoffeld & Co., R., Buffalo, N. Y.
Indiana Leather Stamping Co., Williamsport, Pa.
Planet Co., Westfield, Mass.

WASHERS, Metal.

Hubbard Spring Works, Pontiac, Mich.

WASHERS, Spring.

(For Knife Switches.)
BARNES CO., WALLACE, Bristol, Conn.
HUNT PEN CO., C. HOWARD, Camden, N. J.
Kales-Haskel Co., Detroit, Mich.
Metal Products Corp., Providence.

WATCH DEMAGNETIZERS.
See Demagnetizers.

WATER HEATERS.
See Heaters, Liquid.

WATER WHEELS—See Turbines.

WATERPROOF FIXTURES.
See Fixtures, Marine.

WATT DEMAND INDICATORS.
See Instruments, Integrating.

WATTHOUR METERS.
See Instruments, Integrating.

WATTMETERS.
See Instruments, Indicating.

WAVERS, Hair.

Burnham, E., Chicago, Ill., "Nestle."
Grosert, Thomas, New York, N. Y., "Thomas."
Herrmann Permanent Hair Wave Co., New York.

WAX, Compounds.

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TROTTER CO., T., 588-594 Johnson ave., Brooklyn, N. Y.
Cochrane Chemical Co., Jersey City.
Hildreth & Segelken, New York.
Insulatine Co., New York, "Gylta."
MITCHELL-RAND MFG. CO., New York.
Smith & Nichols, New York, N. Y.
Standard Wax & Import Co., N. Y.

WAX POTS.—See Pots, Melting.

WEBBING COTTON.
See Shelving, Tape, Webbing.

WELDING MACHINES, Elec

GENERAL ELECTRIC CO., Schenectady, N. Y.
C. & C. Elec. & Mfg. Co., Garwood, N. J.
Detroit (Mich.) El. Welding Co., "Vollans."
El. Pr. Maintenance Co., Toledo.
Elec. Ry. Imp. Co., Cleveland, O.
Electric Welding Co., New York.
Indianapolis (Ind.) Switch & Frog Co.
National El. Welder Co., Warren, O.
Thomson Elec. Welding Co., Lynn, Mass.
Toledo El. Welder Co., Cincinnati.
Universal Elec. Welding Co., Long Island City, N. Y.
Welding Materials Co., New York.
Winfield Elec. Welding Mch. Co., Warren, O.

WHEATSTONE BRIDGES — See
See Instruments, Testing.

WHEELS & FORKS, Trolley.

Trolley Wheels, Forks & Sleet Cutters.
ELECTRIC RAILWAY EQUIPMENT CO., Cincinnati, O.
GARTON, W. R., 15 S. Desplaines st., Chicago, Ill. ("Sloan" Sleet Cutter).
LOVELL & CO., F. H., Arlington, N. J.

MATTHEWS & BRO., W. N., 3705 Forest Park blvd., St. Louis, Mo. ("O. K." Sleet Cutter).
Anderson Mfg. Co., A. & J. M., Boston, Mass.
Bayonet Trolley Harp Co., Springfield, O. ("Butterfly" Wheel and Sleet Cutter).
Bonney-Verslage Tool Co., New York (Sleet Cutters).
Brady Brass Co., Jersey City, N. J., "Cyprus."
Cleveland Trolley Wheel Co., Cleveland, O., "McAdams."
Dayton Mfg. Co., Dayton, O.
Erie Malleable Iron Co., Erie, Pa.
Eureka Co., North East, Pa.
Graham & Co., New Haven, Conn.
Hensley Trolley & Mfg. Co., Detroit (Wheel and Sleet Cutters).
Hodgkins Co., J. F., Gardner, Me.
Holland Trolley Supply Co., Cleveland.
International Register Co., Chicago, Ill., "Excelsior."
Ives Co., H. B., New Haven, Conn.
Johns-Manville Co., H. W., New York.
Lumen Bearing Co., Buffalo, "Ideal."
Meckel, Fred L., Chicago, Ill.
Moline Brass Works, Moline, Ill.

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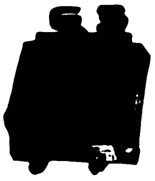
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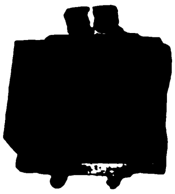
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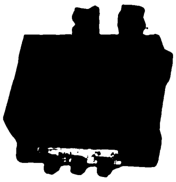
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WINDING MACHINES.
See Machines, Armature.

WINDERS, WIRE—See Reels.

WINDLASSES, ARC LAMP.
See Hangers, Arc Lamp.

WIRE, Aluminum.

ALUMINUM CO. OF AM., Pittsburgh.
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Inland Elec. Co., Chicago, Ill. "Steelite."

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See Conduit, Interior.

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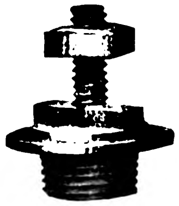

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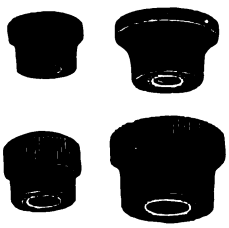

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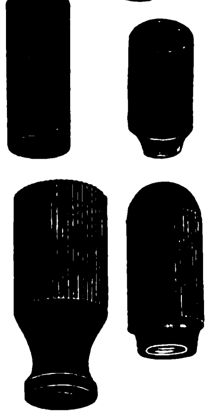

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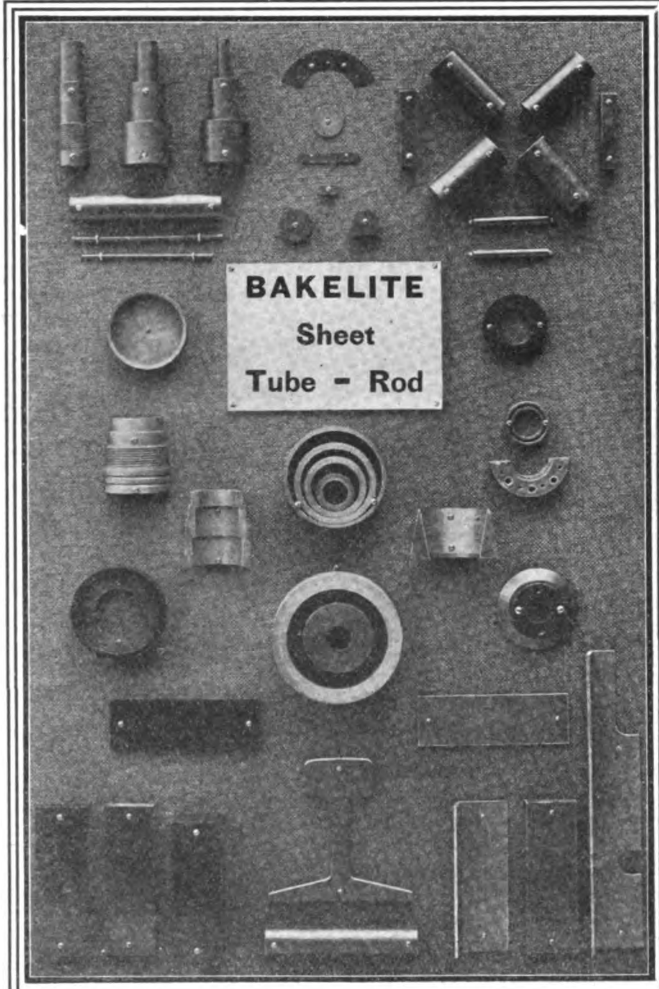

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See Wire, Rubber Covered.

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WIRE GAUGES.

See Gauges, Hack Saw.

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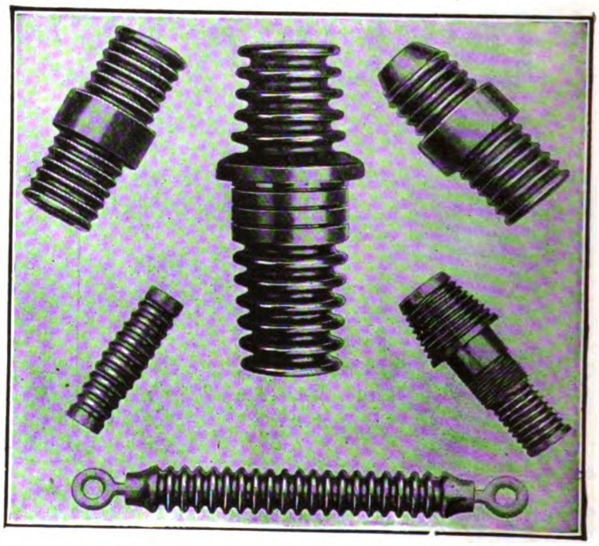

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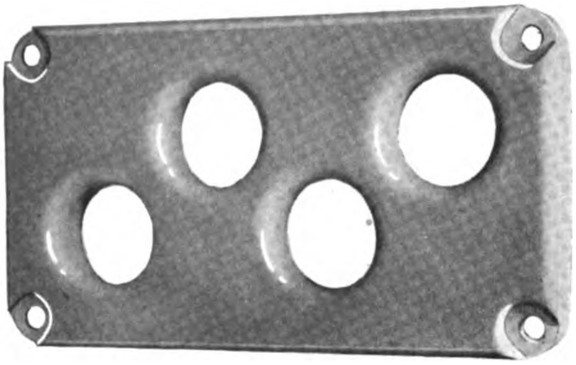

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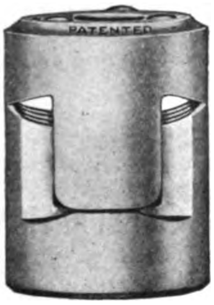

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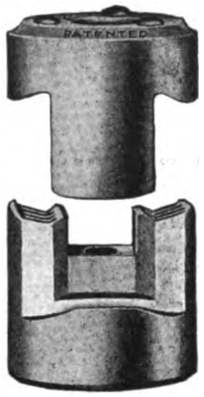

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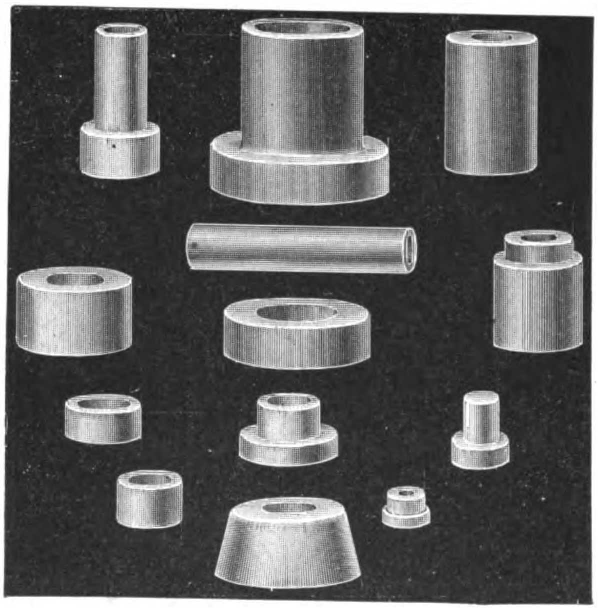

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Stuart-Howland Co., Boston, Mass. (Sole Selling Agents for Standard Magnet Wire Co., Claremont, N. H.) (Silk and Cotton).
Zenith Wire Co., Jamesville, N. Y.

WIRE, Platinum Covered.

Commercial-Research Co., Long Island City, N. Y.

WIRE, Resistance.

German Silver—Manganin—Copper Nickel Alloy—Nickel Cronium Alloy—Nickel Steel.

AMERICAN ELECTRICAL WKS., Phillipsdale, R. I.

BELDEN MFG. CO., 2308 So Western ave., Chicago, Ill.

DRIVER-HARRIS WIRE CO., Harrison, N. J., "Advance," "Climax," "Hercules," "S. B.," "Nichrome," "Therlo."

MOORE, ALFRED F., 200 N. Third st., Philadelphia, Pa.

Am. Brass Co., Waterbury, Conn.
Boker & Co., H., New York, Importers "Superior," "A1A1," "Excello."
Bradford, Kyle & Co., Plymouth, Mass.
Electrical Alloy Co., Morristown, N. J., "Phenix," "Ideal," "Grade A," "Calido."
Hoskins Mfg. Co., Detroit, Mich., "Chromel."
Hudson Wire Co., Ossining, N. Y.
Murray Wire Co., Newark, N. J., "Apex," "Raymur," "Tophet."
Nash Co., Geo., New York, "Acme."
Prosser & Son, Thos., New York, N. Y., "Krupp."
Seymour Mfg. Co., Seymour, Conn.
Waterbury Mfg. Co., Waterbury, Conn.

WIRE, Rubber Covered.

Rubber Covered Wire.
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Lamp Cord.

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AMERICAN ELECTRICAL WORKS, Phillipsdale, R. I., "Americanite."

AMERICAN STEEL & WIRE CO., Chicago, Ill., "W. & M.," "Crown," "Globe," "Americore."

ATLANTIC INSULATED WIRE & CABLE CO., 120 Liberty st., New York, N. Y., "Neptune," "Dolphin," "Triton."

BELDEN MFG. CO., 2308 So. Western ave., Chicago, Ill., "Beldenite."

DETROIT INSULATED WIRE CO., Detroit, Mich.

DRIVER-HARRIS WIRE CO., Harrison, N. J. (Flexible Cord).

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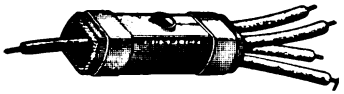

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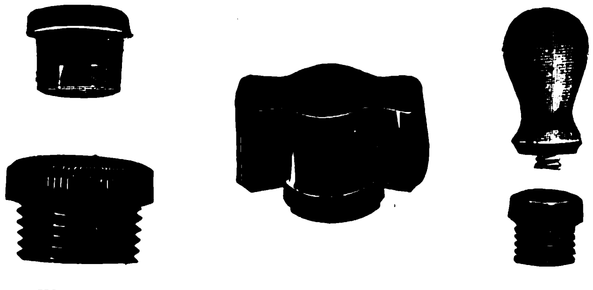

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Astoria Wire Co., Astoria, N. Y.
Bay State Insulated Wire & Cable Co., Hyde Park, Mass., "Maconite."
Bishop Gutta Percha Co., New York, N. Y., "Balata," "Paraxel."
Boston Insulated Wire & Cable Co., Boston, Mass.
Bourn Rubber Co., Providence, R. I., "Star."
Chicago Insulated Wire & Mfg. Co., Chicago, Ill.
Collyer Insulated Wire Co., Pawtucket, R. I., "L. X. L."
Crescent Insulated Wire & Cable Co., Trenton, N. J., "Imperial."
Goodrich Co., B. F., Akron, O., "Diamond."
Goodyear Rubber Insulating Co., New York, N. Y.
Gottschalk Mfg. Co., John W., Philadelphia, Pa. (Flexible Cord and Thread).
Habirshaw Wire Co., Yonkers, N. Y., "Attix."
Hazard Mfg. Co., Wilkes-Barre, Pa.
McElroy, C. H., Lowell, Mass.
Montgomery Co., J. R., Windsor Locks, Conn. ("Electric Thread" for Switch Cord).
Nat'l Conduit & Cable Co., New York.
National India Rubber Co., N. Y.
New England Cable Co., Concord, N. H. (Flexible Cord).
Okonite Co., New York, N. Y.
Phillips Ins. Wire Co., Pawtucket, R. I., "Parac."
Roebling's Sons Co., J. A., Trenton.
Simplex Wire & Cable Co., Boston, Mass., "Caoutchouc," "Simcore."

WIRE SCRAPERS.
See Scrapers, Wire.

WIRE, Steel Spring.

AMERICAN STEEL & WIRE CO., Chicago, Ill.
MORGAN SPRING CO., Worcester, Mass.
Boker & Co., H., New York.
Hammacher, Schlemmer & Co., New York, N. Y., "Red Label," (Importers Eicken & Co.'s German Piano Wire).
Newman Wire Co., C., New York, N. Y., "Hercules."
Roebling's Sons Co., J. A., Trenton.
Washburn Wire Co., Phillipsdale, R. I.
Waterbury Co., New York, N. Y.

WIRE STRETCHERS.
See Comealongs.

WIRE SUPPORTERS.
See Clamps, Cable.

WIRE STRANDING MACHINE.
See Machines. Wire Covering.

WIRE, Telephone (Flexible Cord).

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BELDEN MFG. CO., 2308 So. Western ave., Chicago, Ill.
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Automatic Electric Co., Chicago, Ill.
Gottschalk Mfg. Co., John W., Philadelphia, Pa.
Kellogg Switchboard & Supply Co., Chicago, Ill.
McElroy, C. H., Lowell, Mass., "Dura."
Runzel-Lenz Mfg. Co., Chicago, Ill.
Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y.

WIRE TROLLEY.
See Wire, Bare Copper.

WIRE, Weatherproof.

AMERICAN ELECTRICAL WORKS, Phillipsdale, R. I., "Star."
AMERICAN STEEL & WIRE CO., Chicago, Ill., "Reliance."
ANSONIA ELECTRICAL CO., Ansonia, Conn., "Shield."
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Dielectric Co. of Am., Belleville, N. J.
Hazard Mfg. Co., Wilkes-Barre, Pa.
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National Conduit & Cable Co., New York.
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Okonite Co., N. Y., "Candee."
Peerless Insulated Wire & Cable Co., New York, N. Y.
Phillips Insulated Wire Co., Pawtucket, R. I., "O. K."
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Simplex Wire & Cable Co., Boston, Mass., "T. Z. R."
Waclark Wire Co., New York, N. Y.

WIRELESS CLUSTERS.
See Clusters, Fixture.

WIRELESS INSTRUMENTS.
See Instruments, Wireless.

WOOD FIXTURES.
See Fixtures, Wood.

WOOD INSULATORS.
See Insulators, Wood.

WOOD WORKING MACHINERY.

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WRAPPERS, Conduit, Joint

Phila. Elec. & Mfg. Co., Phila., Pa.

WRAPPERS, TUNGSTEN LAMP.
See Boxes and Wrappers.

WRENCHES.

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Klein & Sons, M., Chicago, Ill. (Lag Screw Tie and Splicing).
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BUNNELL & CO., J. H., 32 Park pl., New York, N. Y.
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Matthiessen & Hegeler Zinc Co., La Salle, Ill.
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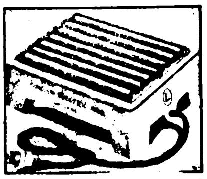

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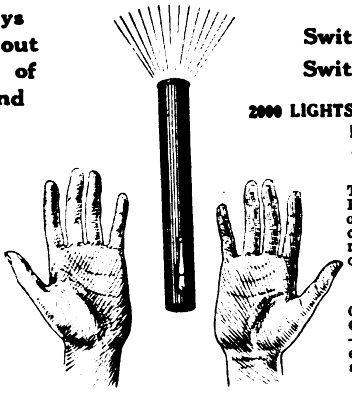

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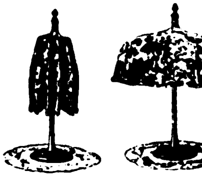

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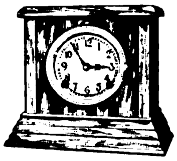

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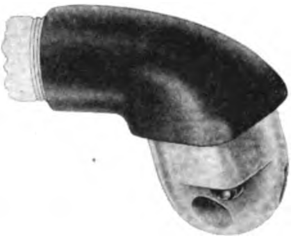

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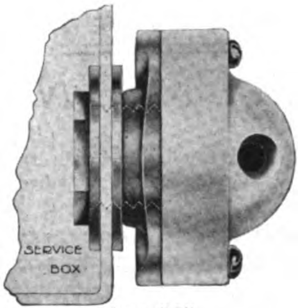

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P means Plain. **T** means Treated.	POLES				ARMS			PINS		TIES	
	POSTS				CROSS			BRACKETS		TIMBER	
	Cedar	Chest-nut	Cy-press	Pine	Pine	Fir	Cy-press	Oak	Locust	Hard	Soft
Atlantic Creosoting & Wood Preserving Works, Norfolk, Va.			T	T	T					T	T
Barnes-Lindsley Mfg. Co., Box 274, Portland, Ore.						P & T					
Bell Lumber Co., Suite 528, Security Bank Bldg., M'nneapolis, Minn. Cedar Poles Plain or Treated Good Stock. Quick Service	P & T										
Central Lumber Co., Chattanooga, Tenn. Plain, Painted or Treated. Write for prices.					P			P & T	P		
E. T. Chapin Co., 505 Columbia Bldg. Spokane, Wash. Big Butted Red Cedar Poles. Treated with C-A Preserver. Hot Tank Process.	P & T										
Crawford Cedar Co., Menominee, Mich. Northern White Cedar. Western Red Cedar. Poles, Posts, Ties	P & T									P & T	
Diamond Pole and Piling Co., 716 Ludington St., Escanaba, Mich.	P									P	P
Finch Bros., Lyceum Bldg., Duluth, Minn.	P & T									P & T	P & T
John H. Fowler Co., Fisher Bldg., Chicago. Established 1900. Main Yards, Chicago.	P & T	P	P & T							P	P
F. F. Gruninger, 431 So. Dearborn St., Chicago	P & T	P	P							P & T	P & T
Kaye & Carter Lumber Co., 802 Lumber Exchange, Minneapolis, Minn.	P & T										P
Larson Bros. Lumber Co. 736 Security Bldg., Minneapolis, Minn.	P & T									P	P
Lindsley Bros. Co., Spokane, Wash. We use Avenarius Carbolineum for treating.	P & T					P & T					P & T
Louisiana Red Cypress Co., New Orleans La. Gulf Coast Cypress needs no treatment. Trunking & Capping			P				P				P
Mac Gillis & Gibbs Co., 1302 Wells Bldg., Milwaukee, Wis. Immediate Shipment Guaranteed.	P & T										P
Mercereau-Hawkins Tie Co., Robson-Prichard Bldg., Huntington, W. Va.										P	P
J. W. Morrison Lumber Co., 927-8 Lumber Exchange, Minneapolis, Minn. White Cedar, Idaho Red Cedar	P & T										
T. J. Moss Tie Co., Security Bldg., St. Louis, Mo.			P							P & T	P & T
National Pin & Bracket Co., North Vernon, Ind. Plain, Painted or Treated. Write for prices								P & T	P		
National Pole Co., 741 Peyton Bldg., Spokane, Wash.	P & T										
Naugle Pole & Tie Co., 5 So. Wabash Ave. Chicago, Ill.	P & T									P & T	P & T
T. M. Partridge Lumber Co., 730 Lumber Exchange, Minneapolis, Minn. Western Red Cedar, Northern White Cedar	P										P
Southern Exchange Co., 97 Warren St., N. Y. Southern White Cedar Octagonal Poles	P & T	P		P & T	P & T			P	P		P & T
Three States Cedar Co., 1102 Plymouth Bldg., Minneapolis, Minn.	P										
Torrey Cedar Co., Clintonville, Wis. Melrose Park, Ill. Prompt Shipments.	P & T										P & T
Western Lumber & Pole Co., Spokane, Wash. 31 Cedar Pole Yards.	P & T					P & T					P & T
Wetherby & Co., E. C., Warroad, Minn. Complete Stock White Cedar Poles. Immediate Shipment Guaranteed.	P & T										P & T
Wheeler-Arnold Co., Wittenberg, Wis.	P										P
Wisconsin Land & Lumber Co., Hermansville, Mich. White Cedar Poles.	P									P	P

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C means Commutator Refilling
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NORTHWESTERN ELEC. CO., 613 W. Adams...............A-C-S
THOMPSON & JAMESON, 126 S. Clinton...............A-C-M-R-S

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RAPP & ZOLLINGER ELEC. CO., 714 Barr................A-C-S

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UNION ELEC. MFG. CO., 115 W. Colfax ave..............A-C-S

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RIDLON COMPANY, FRANK, 158 Summer..........A-C-M-R-V-S
WERBY & CO., A., 287 Atlantic ave....................A-C-R-S

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COMMERCIAL ELECL. SUPPLY Co.................................S
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ONEIDA ELEC. CO., 300 West Broadway..........................S
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SCHWARTZ & LAND, 207 Centre.....................................R-S
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ULARY, WILLIAM A., 119 N. 6th....................................A-C-R
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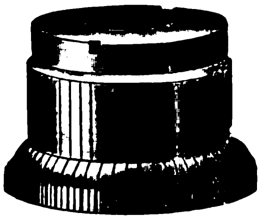

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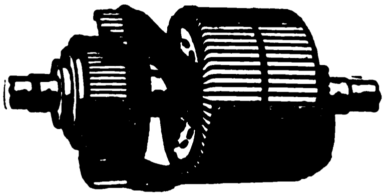

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CROUSE-HINDS CO., 30 Church. Tel., Cortlandt 365.

CULVER-STEARNS MFG. CO., 41 Warren. Tel., Barclay 5057.

CUTTER ELEC'L & MFG. CO., 50 Church. Tel., Rector 839.

DELAWARE HARD FIBRE CO., 50 Church. Tel., Cort. 6344.

DENNISON & BUCK CO., 50 Church. Tel., Cortlandt 5759.

DETROIT FUSE & MFG. CO., 114 Liberty. Tel., Rector 1465.

DIEHL MFG. CO., 90 Prince. Tel., Spring 9800.

DOTY MFG. CO., 50 Church. Tel., Cortlandt 1708.

EAGLE GLASS & MFG. CO., 50 Park pl. Tel., Barclay 5059.

ELECTRIC RY. EQUIP. CO., 30 Church. Tel., Cortlandt 3389.

ELECTRICAL SALES CO., 114 Liberty.
Tel., Rector 1465. (General Distributors.)
Schwarze Elec. Co.

FITZGERALD MFG. CO., 41 Warren. Tel., Barclay 5057-8.

FREEMAN ELEC. CO., E. H., 154 Nassau. Tel., Beekman 5249.

GILL BROS. CO., 101 Park ave. Tel., Murray Hill 5343.

GLEASON-TIEBOUT GLASS CO., 71 West 23d.
Tel., Gramercy 1575.

HALL, C. O., 147 W. 35th. Tel., Greeley 4040.
(Agent for) Kimble Elec. Co
Peerless Electric Co.

HALLETT IRON WKS., 6 Church. Tel., Cortlandt 8869.

HAMILTON-BEACH CO., 114 Liberty. Tel., Rector 1088.

HART MFG. CO., 30 Church. Tel., Cortlandt 487.

HARTER MFG. CO., 6 Church. Tel., Cortlandt 8869.

HESSEL, W. F., 114 Liberty. Tel., Rector 1465.
N. Y. Mgr.: Detroit Fuse & Mfg. Co.
N. Y. Mgr.: Palmer Elec. & Mfg. Co.
Sole Selling Agent: Rattan Mfg. Co.

HISEY-WOLF MACHINE CO., 50 Church. Tel., Cortlandt 1047.

HOYT ELEC'L INST. WORKS, 136 Liberty. Tel., Rector 2124.

NEW YORK

NEW YORK CITY, (*Continued*)

HYGRADE INCANDESCENT LAMP CO., 50 Church.
Tel., Cortlandt 5575.
IDEAL ELEC. & MFG. CO., 50 Church. Tel., Cortlandt 1266.
IMPERIAL ELEC. CO., 253 Broadway. Tel., Barclay 6448.
INDUSTRIAL CONTROLLER CO., 50 Church.
Tel., Cortlandt 8174.
JULES ELEC. CO., 209 W. 48th. Tel., Bryant 6460.
KIMBLE ELEC. CO., 147 W. 35th. Tel., Greeley 4040.
L. & M. RUBBER CO., 50 Church. Tel., Cortlandt 3712.
LANZ & SONS, MATTHEW, 6 Church. Tel., Cortlandt 8869.
LINE-MATERIAL CO., 114 Liberty. Tel., Rector 1465.
LUMINOUS UNIT CO., 56 West 45th. Tel., Bryant 1695.
McDOWELL, E. O., 154 Nassau. Tel., Beekman 5249.
(Agent for)
E. H. Freeman Elec. Co.
Trenton Porcelain Co.
Trenton Elec. & Conduit Co.
Chelton Elec. Co.
McDOWELL, WM. T., 50 Church. Tel., Cortlandt 5759.
(Agent for) Dennison & Buck Co.
McGILL MFG. CO., 137 Liberty. Tel., Rector 1626.
J. Joseph, Mgr.
MACBETH-EVANS GLASS CO., 143 Madison ave.
Tel., Madison Square 8122.
MATTHEWS & BRO., W. N., 30 Church. Tel., Cortlandt 1885.
MENOMINEE ELEC. MFG. CO., 6 Church. Tel., Cort. 8869.
MILLER & CO., EDW., 70 Park pl. Tel., Barclay 6632.
MONARCH ELEC. TIME SYSTEMS, 50 Church.
Tel., Cortlandt 8174.
NEW HAVEN ELEC. MFG. CO., 152 Chambers.
Tel., Barclay 7784.
NORTHWOOD CO., H., 19 Madison ave. Tel., Mad. Sq. 9723.
PALMER ELEC. & MFG. CO., 114 Liberty. Tel., Rector 1465.
PASS & SEYMOUR, 6 Church. Tel., Cortlandt 433.
PEERLESS ELEC. CO., 147 W. 35th. Tel., Greeley 4040.
PEERLESS LIGHT CO., 68 Warren. Tel., Barclay 7469.
PERKINS ELEC. SWITCH MFG. CO., 51 East 42d.
Tel., Murray Hill 4507.
PHILLIPS CO., J. G., 6 Church. Tel., Cortlandt 8869.
(Agents for)
L. B. Allen Co.
Hallett Iron Wks.
Matthew Lanz & Sons.
Specialty Device Co.
PITTSBURGH LAMP, BRASS & GLASS CO., 35 West 23d.
Tel., Gramercy 236.
P. R. MFG. CO., 32 Frankfort. Tel., Beekman 4117.
RATTAN MFG. CO., 114 Liberty. Tel., Rector 1465.
REYNOLDS ELECTRIC COMPANY, 1123 Broadway.
Tel., Farragut 8866.
SCHWARZE ELEC. CO., 114 Liberty. Tel., Rector 1465.
SEARS, HENRY D., 143 Liberty. Tel., Cortlandt 8741.
SPECIALTY DEVICE CO., 6 Church. Tel., Cortlandt 8869.
STANDARD ELEC. TOOL CO., 30 Church.
Tel., Cortlandt 7218.
STANDARD VARNISH WKS., 29 Broadway. Tel., Rector 4120.
STANLEY, ARTHUR F., 32 Frankfort. Tel., Beekman 4117.
(Agent for) P. R. Mfg. Co.
STEEL CITY ELEC. CO., 6 Church. Tel., Cortlandt 8869.
TRENTON ELEC. & CONDUIT CO., 154 Nassau.
Tel., Beekman 5249.
TRENTON PORCELAIN CO., 154 Nassau. Tel., Beekman 5249.
U. S. ELECL. TOOL CO., 50 Church. Tel., Cortlandt 5794.
VAN DORN ELEC. TOOL CO., 30 Church. Tel., 3179.
V. V. FITTINGS CO., 39 Cortlandt. Tel., Cortlandt 497.
WALDEN MFG. CO., 41 Warren. Tel., Barclay 5057-8.
WILMINGTON FIBRE SPECIALTY CO., 36 Warren.
Tel., Barclay 6574.

NORTH CAROLINA

CHARLOTTE

SMITH, SAM'L J., 235 South Tryon st.

OHIO

CINCINNATI

CROUSE-HINDS CO., 18 East Fourth. Tel., Main 4200.
MACBETH-EVANS GLASS CO., 43 Pickering.

CLEVELAND

GILL BROS. CO., 1010 Citizens Bldg. Tel., Main 417.
MACBETH-EVANS GLASS CO., 1900 Euclid Bldg.

OREGON

PORTLAND

ALLEN CO., L. B., 620 Morgan Bldg. Tel., Marshall 1916.

PENNSYLVANIA

PHILADELPHIA

ALPHADUCT CO., 249 North 12th. Both Phones.
BRISTOL CO., 1326 Chestnut. Bell Tel., Walnut 2290.
CLARK, L. P., 249 North 12th. Both Phones.
(Representing)
Alphaduct Co.
Detroit Insulated Wire Co.
Samson Elec. Co.
CONSOLIDATED ELEC. LAMP CO., 1215 Filbert.
Tel., (Bell) Filbert 2345.
DAVIS ELEC. CO., C. C., 514 Lippincott Bldg. Both Phones.
(Agents for)
Cleveland Switchboard Co.
M. W. Dunton Co.
Multi Refillable Fuse Co.
DETROIT INS. WIRE CO., 249 N. 12th. Both Phones.
DIEHL MFG. CO., 1305 Race. Tel., (Bell) Filbert 4632;
(Keystone) Race 1225.
GILBERT, F. E., 1326 Chestnut. Bell Tel., Walnut 2299.
(Agent for)
Bristol Co.
Weston Electrical Instrument Co.
MACBETH-EVANS GLASS CO., 42 South Eighth.
Tel., Walnut 995.
MECHANICAL APPLIANCE CO., 1328 Chestnut.
Tel. (Bell), Filbert 4384; (Keystone), Race 855.
NATIONAL FIBRE & INSULATION CO., 111 N.2d.
Tel., Market 4037. Main 1554.
OETERS, EDGAR O., The Bourse. Tel., Bell Lombard 490—
Keystone Main 6617.
PITTSBURGH LAMP, BRASS & GLASS CO., 731 Arch.
Tel., (Bell) Market 2435 (Keystone) Main 2572.
SAMSON ELEC. CO., 240 North 12th. Both Phones.
WAGNER ELEC. MFG. CO., Real Estate Trust Bldg.
Tel., (Bell) Walnut 2141-2 (Keystone) Race 1033.
WESTON ELECTRICAL INSTRUMENT CO., 1326 Chestnut.
Bell Tel., Walnut 2299.

TEXAS

DALLAS

MACBETH-EVANS GLASS CO., 1106 Southwestern Life Bldg.
Tel., Main 5566.

CANADA—ALBERTA

EDMONTON

ALLEN CO., L. B., Western Cartage Bldg. Tel., Phone 6345.

MANITOBA

WINNIPEG

ALLEN CO., L. B., 12 Cumberland Block. Tel., Garry 301.
PRINGLE, R. E. T., 150 Princess st.
(Agents for)
Adams-Bagnall Elec. Co.
Appleton Elec. Co.
Electric Tachometer Co.
Gould Storage Battery Co.
New Process Specialty Co.
Pacific Elec. Mfg. Co.
P. & B. Mfg. Co.
Union Metal Mfg. Co.
Van Dorn Elec. Tool Co.
Wisconsin Elec. Co.

ONTARIO

OTTAWA

PRINGLE, R. E. T., Bank St. Chambers.
(Agents for)
Adams-Bagnall Elec. Co.
Appleton Elec. Co.
Electric Tachometer Co.
Gould Storage Battery Co.
New Process Specialty Co.
Pacific Elec. Mfg. Co.
P. & B. Mfg. Co.
Union Metal Mfg. Co.
Van Dorn Elec. Tool Co.
Wisconsin Elec. Co.

TORONTO

PRINGLE, R. E. T., 95 King st., East.
(Agents for)
Adams-Bagnall Elec. Co.
Appleton Elec. Co.
Electric Tachometer Co.
Gould Storage Battery Co.
New Process Specialty Co.
Pacific Elec. Mfg. Co.
P. & B. Mfg. Co.
Union Metal Mfg. Co.
Van Dorn Elec. Tool Co.
Wisconsin Elec. Co.

QUEBEC

MONTREAL

ADAMS-BAGNALL ELEC. CO., 901 New Birks Bldg.
APPLETON ELEC. CO., 901 New Birks Bldg.
ELECTRIC TACHOMETER CO., 901 New Birks Bldg.
GOULD STORAGE BATTERY CO., 901 New Birks Bldg.
NEW PROCESS SPECIALTY CO., 901 New Birks Bldg.
PACIFIC ELEC. MFG. CO., 901 New Birks Bldg.
PRINGLE, R. E. T., 901 New Birks Bldg.
(Agents for)
Adams-Bagnall Elec. Co.
Appleton Elec. Co.
Electric Tachometer Co.
Gould Storage Battery Co
New Process Specialty Co.
Pacific Elec. Mfg. Co.
P. & B. Mfg. Co.
Union Metal Mfg. Co.
Van Dorn Elec. Tool Co.
Wisconsin Elec. Co.
P. & B. MFG. CO., 901 New Birks Bldg.
UNION METAL MFG. CO., 901 New Birks Bldg.
VAN DORN ELEC. TOOL CO., 901 New Birks Bldg.
WALPOLE RUBBER CO., LTD., 8 McGill College ave.
Tel., Main 7193.
WISCONSIN ELEC. CO., 901 New Birks Bldg.

SASKATCHEWAN

REGINA

ALLEN CO., L. B., 1826 Hamilton St. Tel., 5372.

Trade Names

Ab Auto Lites auto lamps: Adams Bagnall Elec. Co., Cleveland, O.

Abacot lightning arrester: Lord Mfg. Co., Brooklyn, N. Y.

Abbott ground clamp: A-A Electric Mfg. Co., Bridgeport, Conn.

Abbott links: Harvey Hubbell, Bridgeport, Conn.

A. B. C. chain: Am. Ball Chain Wks., 12 Wooster, New York.

A. B. C. hanger: Fee & Mason, New York.

A. B. C. charging plug: Albert & J. M. Anderson Mfg. Co., Boston.

Abell pump: Standard Thermometer Co., Boston.

A-Best-O sad irons: Dover Mfg. Co., Canal Dover, O.

ABolites fix.: Adams-Bagnall El. Co., Cleveland, Ohio.

A. C. horn: Russell El. Co., Danbury, Ct.

Acme annunciator: Meon Mfg. Co., Chicago, Ill.

Acme bell: Ansonia (Conn.) Elec'l Co.

Acme box: Krantz Mfg. Co., Brooklyn.

Acme brush: Thomson-Bonney Co., B'klyn.

Acme connector: Reliable Electric Co., Chicago, Ill.

Acme extinguisher: Missouri Lamp & Mfg. Co., St. Louis, Mo.

Acme fan: Dilg Mfg. & Trading Co., New York.

Acme Rapid Fire bat.: Nungesser Carbon & Battery Co., Cleveland, Ohio.

Acme shade hold.: Waterbury Mfg. Co., Waterbury, Conn.

Acme tape: General Electric Co., Schenectady, N. Y.

Acme resist. wire: G. Nash Co., N. Y.

Acorn switch: Cutler-Hammer Mfg. Co., Milwaukee, Wis.

Acousticon hearing device: General Acoustic Co., New York, N. Y.

Ad-a-link bracket: Holtzer-Cabot Elec. Co., Boston, Mass.

Adama I. v. trans: Haas El. & Mfg. Co., Springfield, Ill.

Adaptibox: Adapti Mfg. Co., Cleveland.

Add Water battery: Burns-Boston Battery & Mfg. Wks., Boston, Mass.

Addie tester: El. Spec. Co., Cresco, Ia.

Adjustaphone brackets: Chicago Writing Mach. Co., Galesburg, Ill.

Writing Mach. Co., Galesburg, Ill.

Adjustarod guy rod: Crouse-Hinds Co., Syracuse, N. Y.

Adjusto ground clamp: S. Robt. Schwartz & Bro., New York.

Adlake lamp & outfit: Adams & Westlake Co., Chicago, Ill.

Adlite shade: Harter Mfg. Co., Chicago.

Advance gas ltg. burner: Samson Elec. Co., Canton, Mass.

Advance clamp: Heinemann Elec. Co., Philadelphia, Pa.

Advance freezer: V. Clad & Sons, Phila.

Advance inst: Eldredge Elec. Mfg. Co., 39 P. O. Square, Springfield, Mass.

Advance wire: Driver-Harris Wire Co., Harrison, N. J.

Aerco aeroplane: A. E. Rittenhouse Co., Honeoye Falls, N. Y.

Aero messenger car: Fairmount Elec. & Mfg. Co., Philadelphia, Pa.

Aetna insulation: A. & J. M. Anderson Mfg. Co., Boston, Mass.

A. G. E. arma. mach.: Amer. Gen. Engrg. Co., New York, N. Y.

Ahlstrom exp. bolt: Stewart & Romaine Mfg. Co., Phila., Pa.

Air Alarm fire alarm: Metropolitan Elec. Protective Co., 130 W. 26th st., New York, N. Y.

Ajax drier: Central Tele. & Elec. Co., 310 No. 11th st., St. Louis, Mo.

Ajax expansion and toggle bolts: Chicago Nut Co., Chicago, Ill.

Ajax lightning arrester: Albert & J. M. Anderson Mfg. Co., Boston, Mass.

Ajax light fixture: Line Material Co., So. Milwaukee, Wis.

Ajax paint: Sherwin-Williams Co., Cleveland, O.

Ajax toy motor: Kendrick & Davis, Lebanon, N. H.

Aladdin dry battery: Beacon Min. Elec. Co., 118 Duane st., New York.

Aladdin lighting torch: Universal Nov. Co., New York, N. Y.

Alba carbon: L. E. Frorup & Co., N. Y.

Alba shade and fixtures: Macbeth-Evans Glass Co., Pittsburgh, Pa.

Albedoglas shade: Gleason-Tiebout Glass Co., 71 W. 23d st., New York, N. Y.

Alco: Amer. Lava Co., Chattanooga.

Alco clothes washer: Altorfer Bros. Co., Dept. 906, Roanoke & Peoria, Ill.

Alexander arc lamp: Radio Elec. Co., New York.

Allen Randall bolt clipper: H. K. Porter, 6 Ashland, Everett, Mass.

Alligator connector: Fairmount Elec. & Mfg. Co., Philadelphia, Pa.

Alligator-Jaw connector: Albert & J. M. Anderson, Brookline, Mass.

All-in-one spark plug: Frontier Specialty Co., Buffalo, N. Y.

All-in-one clamp: Fairmount Elec. & Mfg. Co., Philadelphia, Pa.

All-Nite-Lite transformer socket: General Electric Co., Schenectady, N. Y.

All-Ways desk light: Amer. Elec. Co., Chicago, Ill.

Alpha auto lamp: Badger Brass Co., Kenosha, Wis.

Alpha-Bet sign: Chicago Min. Lamp Wks., Chicago, Ill.

Altick tele. booth: Fold. Cab. Co., Lancaster, Pa.

Altman portable desk push button: Minerallac Elec. Co., Chicago, Ill.

Alumaduct conduit: Nat. Enamel. & Mfg. Co., Youngstown, O.

Always Reliable furnace: O. Bernz, Newark, N. J.

A-M shade holder: Art Metal Mfg. Co., Cleveland, O.

Am. Beauty htg. devices: Am. Elec'l Heater Co., Detroit, Mich.

Am. Beauty tel: Am. Elec. Co., Chicago.

Am. Grip comealongs: M. Klein & Sons, Chicago, Ill.

Am. ozonizers: Birtman Elec. Co., Chicago, Ill.

Am. trolley pole catcher: Trolley Supply Co., Canton, O.

Americanite wire: Amer. Elec'l Wks., Phillipsdale, R. I.

Americore wire: American Steel & Wire Co., Chicago, Ill.

Ampro bell: Francis Keil & Son., New York, N. Y.

Ancapco wire: American Brass Co., Waterbury, Conn.

Anchor Edi-Swan auto connector: Metal Specialties Mfg. Co., 748 W. Monroe st., Chicago, Ill.

Annunciphone tele. & swboards: Samson Elec. Co., Canton, Mass.

Anthony boring tool: P. R. Mfg. Co., 621 Bellevue ave., Detroit, Mich.

Anthony conduit bender: M. B. Austin & Co., 700 Jackson blvd., Chicago, Ill.

Anti-Doe med bat.: Manhattan Elec'l Sup. Co., 17 Park pl., New York.

Anthralineum pole: Western Wood Preserving Co., Los Angeles, Cal.

Anti-Knot plugs: Tregoning Elec. Mfg. Co., 416 W. Prospect st., Cleveland, O.

Anti-Screw Midget button: Francis Keil & Son, New York.

Antiseptic preservative: Amer. Wood Pres. Co., Chicago.

Anti-Spark commutator comp.: J. F. Walsh Co., Pittsfield, Mass.

Anti-Wood switch and push button: Francis Keil & Son, New York.

Anyangl bracket: J. E. Zang, Johnstown, Pa.

Any Angle lamp fix: Phelps Mfg. Co., Detroit, Mich.

Anywhere light: Wm. F. Wolff Co., New York.

A1A1 wire: H. Boker & Co., New York.

Apelco auto system: Splitdorf Elec. Co., Newark, N. J.

Apex res. wire: Murray Wire Co., Newark, N. J.

Apex Vac. cleaner: Utilities Service Co., Cleveland, O.

Apollo elec. horn: Auto Supply Mfg. Co., Brooklyn, N. Y.

Apollo med. bat.: Manhattan Elec'l Sup. Co., 17 Park pl., New York.

Apollo steel & iron: Am. Sheet & Tin Plate Co., Frick Bldg., Pittsburgh, Pa.

Apple ignition outfits: Dayton Elec'l Mfg. Co., Dayton, O.

Arbeco auto lamp: Reynolds-Brown Co., Chicago, Ill.

Arclets fix. fittings: Fairmount Elec. & Mfg. Co., Philadelphia, Pa.

Arco carbon: L. E. Frorup & Co., N. Y.

Arco Wand vac. cleaner: American Radiator Co., Chicago, Ill.

Arcover line mat: Electrose Mfg. Co., Brooklyn, N. Y.

Argo elec. veh.: Am. Elec. Car Co., Saginaw, Mich.

Argus arrester: Foote, Pierson & Co., New York, N. Y.

Argus signs: Harvey Deschere & Co., Hoboken, N. J.

Aristo photo eng. lamp: Eastman Kodak Co., Rochester, N. Y.

Aristo time switch: Chicago Elec. Time Switch Co., Chicago, Ill.

Arkless fuse: Detroit Fuse & Mfg. Co., 1411 Rivard, Detroit, Mich.

Arklite fixture: Shapiro & Aronson, N. Y.

Armalac paint: Walpole Tire & Rubber Co., Walpole, Mass.

Armorduct conduit: Safety Armorite Conduit Co., Bailey Farrell Bldg., Pittsburgh, Pa.

Armyduct conduit: Nat'l Enamel. & Mfg. Co., Youngstown, O.

Arroplug attach plug: Arrow Electric Co., Hartford, Conn.

Arrolock locking socket: Arrow Elec. Co., Hartford, Conn.

Arrow trolleys & chairs: Central Tele. & Elec. Co., 310 No. 11th st., St. Louis, Mo.

Arrow E specialties: Arrow Elec. Co., Hartford, Conn.

Arrow spark plug: Reflex Ignition Co., Cleveland, O.

Asam-Wright perforating mach: Asam Bros., Phila., Pa.

Astoria hangers and clamps: Fee & Mason, New York.

Atlantic battery: National Carbon Co., Cleveland, O.

Atlas battery: Guaranteed Elec. Storage Bat. Co., St. Louis, Mo.

Attix wire: Habirshaw Wire Co., Yonkers, N. Y.

Audiffren Singrun refrigerators: H. W. Johns-Manville Co., New York.

Audiphone hear. dev.: Stolz Electrophone Co., Chicago, Ill.

Aurene glass shade: Steuben Glass Works, Corning, N. Y.

Aurora glass shade: Consolidated Lamp & Glass Co., Coraopolis, Pa.

Autex battery: Willard Storage Bat. Co., Cleveland, O.

Auth specialties: De Veau Tele. Mfg. Co., 477 18th, Brooklyn, N. Y.

Auto Flex auto. conduit: Nat'l Metal Molding Co., 1107 Fulton Bldg., Pittsburgh, Pa.

Auto-Kure battery: J. H. Bunnell & Co., 32 Park pl., New York, N. Y.

Auto-Recti bell: Edwards & Co., New York, N. Y.

Auto-Sparker magneto: Motsinger Device Mfg. Co., La Fayette, Ind.

Autobis auto horn: Holtzer-Cabot Elec. Co., Boston, Mass.

Autocool disc fan: De Vilbiss Mfg. Co., Toledo, O.

Autocrat battery: Stackpole Carbon Co., St. Mary's, Pa.

Autocrat heating devices: Acme Elec. Heater Co., Detroit, Mich.

Autoduct conduit: Am. Circular Loom Co., New York, N. Y.

Autophone tele. & switch: S. H. Couch Co., Norfolk Downs, Mass.

Avenarius wood preservative: Carbolineum Wood Preserving Co., Milwaukee, Wis.

Avery galvanometer: Manhattan Elecl. Supply Co., 17 Park pl., New York.

Awebco cotton: Anchor Webbing Co., Woonsocket, R. I.

A. W. regulator: Packard Elec. Co., 520 Dana ave., Warren, O.

A. W. switch box: Geo. Cutter Co., 411 Notre Dame st., So. Bend, Ind.

Axo wet bat.: Leclanche Bat. Co., N. Y.

B. A. B. vac. clean.: Backus Co., Newark, N. J.

Badger light: Pacific Elec. Co., La Crosse, Wis.

Bakelite hard fibre: Continental Fibre Co., Newark, Del.

Bakelite insulation: Gen. Bakelite Co., 100 William st., New York, N. Y.

Balata wire: Bishop Butta Percha Co., New York.

Ballard Cutter: Wildman Mfg. Co., Norristown, Pa.

Ballistiz galvanometers: Foote, Pierson & Co., New York.

Barclay insulators: Brookfield Glass Co., 2 Rector, New York, N. Y.

Barnes vac. clean.: Advance Mfg. Co., 2 W. Willard st, Kalamazoo, Mich.

Barol wood preservative: Anthrol Wood Preserving Co., New York.

Barrett jacks: Duff Mfg. Co., Pittsburgh.

Barry fuse puller: Central Motor Supply Co., Rochester, N. Y.

Barthel torch: Globe Gas Lt. Co., Boston.

Bartholdi lighter: A. L. Bogart Co., N.Y.

Bartlett operating room lite: Scanlan-Morris Co., Madison, Wis.

Barton gongs: Bevin Bros. Mfg. Co., E. Hampton, Conn.

Battersea brush: Morgan Crucible Co., 112 Liberty st., New York.

Baum disc. switch: Pacific El. & Mfg. Co., San Francisco.

B. B. tool: Ft. Wayne El. Wks. of G. E. Co., 1612 Broadway, Ft. Wayne.

B. B. wire: Indiana Steel & Wire Co., Muncie, Ind.

Beacon inst.: Clapp-Eastham Co., Cambridge, Mass.

Beardsley bracket: Naugatuck Malleable Iron Wks., Naugatuck, Conn.

Beat-Em-All plug: A. R. Mosler & Co., Mt. Vernon, N. Y.

Beaux Arts shades: Gleason-Tiebout Glass Co., 71 W. 23d st., New York, N. Y.

Beaver stocks & dies: Borden Co., Warren, O.

Becoc auto specialties: Michigan Motor Supplies Co., Detroit, Mich.

Becco min. inc. lamp: Bronx El. Co., Chicago, Ill.

Bee-Dee fixture: Brandt-Dent Co., Watertown, Wis.

Beeko specialties: J. H. Bunnell & Co., 32 Park pl., New York.

Bee specialties: Birtman Elec. Co., Chicago, Ill.

Belcher group clamp: Hubbard & Co., Pittsburgh, Pa.

Beldenamel and Beldenite wire: Belden Mfg. Co., 2308 So. Western ave., Chicago, Ill.

Belden-Bakelite insulation: Belden Mfg. Co., 2308 S. Western ave., Chicago, Ill.

Bella elec. candle: Baker-Smith Co., San Francisco, Cal.

Belle Bell Ringing Transformers: Packard Elec. Co., 520 Dana ave., Warren, O.

Belvidere lamp ins.: Nat. Sewing Mach. Co., Belvidere, Ill.

Benco socket: Benjamin Elec. Mfg. Co., 120 S. Sangamon st., Chicago, Ill.

Bendo metal moulding benders: Alfred Whiteley, New York.

Berdon auto starter: Esterline Co., Indianapolis, Ind.

Bernard's pliers: Scholhorn Co., Wm., New Haven, Conn.

Berylite glass shade: L. Plaut & Co., New York.

Best inc. lamp: New York (N. Y.) Elec. Lamp Co.

Best-Yet shade: R. S. Furniss, Chicago.

Biddle auto lamp adapter: Horn & Brannen, Philadelphia, Pa.

Bierce specialties: Specialty Device Co., Cincinnati, Ohio.

Big 3 clothes washer: Barlow & Seelig Mfg. Co., Ripon, Wis.

Big Ben vacuum cleaner: Clements Mfg. Co., Chicago, Ill.

Big Brute test clamp: R. S. Mueller & Co., Cleveland, Ohio.

Big Four washer: Grinnell Wash. Mach. Co., Grinnell, Ia.

Bihlamier vibrator: W. D. Allison Co., Indianapolis.

Bio carbon: Chas. L. Kiewert Co., N. Y.

Bisor shade: National X-Ray Reflector Co., 233 Jackson blvd., Chicago, Ill.

Bi-Une tele. & swboards: Samson Elec. Co., Canton, Mass.

Black Diamond mine hanger, Electric Railway Equipment Co., Cincinnati, O.

Black Diamond tape: M. W. Dunton Co., Providence, R. I.

Black Eagle spark plug: Standard Co., Torrington, Conn.

Black rigid conduit: Central Tube Co., Pittsburgh, Pa.

Blackburn's telescoping: Everstick Anchor Co., St. Louis.

Blackman fan: Howard & Morse, N. Y.

Blake pumps: International Steam Pump Co., New York, N. Y.

Blanco shade: Gleason-Tiebout Glass Co., 71 W. 23d st., New York, N. Y.

Blitz ignition: Elec'l Specialties Co., Omaha, Neb.

Blizzard refrigerator: Lueck Mfg. Co., Milwaukee, Wis.

Bloch-Wolf cutter: Wolf El. Promoting Co., Cincinnati.

Blow-Rite fuses: Reliable Electric Co., Chicago, Ill.

Blue Seal dry bat.: Manhattan Elecl. Supply Co., 17 Park pl., New York.

Bo-Arm & Bo-Arrow bracket: Hubbard & Co., Pittsburgh, Pa.

Boch insulators: R. Thomas & Sons Co., East Liverpool, O.

Boland-Grannis elec. vehicle: Am. Elec. Car Co., Saginaw, Mich.

Boltless clamp: W. N. Matthews & Bro., 3705 Forest Park blvd., St. Louis.

Bolton battery connector: Simplex Auto Specialty Co., Detroit, Mich.

Boone exp. bits.: H. G. Osborne, B'klyn.

Borland vac. clean.: H. J. Astle & Co., Providence.

Borland-Grannis elec. vehicle: Am. Elec. Car Co., Saginaw, Mich.

Boron-Aluminum insulators: Fred M. Locke, Victor, N. Y.

Boron-Silica insulators: Fred M. Locke, Victor, N. Y.

Boss conduit benders: M. B. Austin & Co., 700 Jackson blvd., Chicago, Ill.

Boss Conduit Fitting: Electrical Specialty Mfg. Co., Providence, R. I.

Boss meat chopper: Cin. Butchers' Sup. Co., Cincinnati.

Boston gas ltg. burner: Samson Elec. Co., Canton, Mass.

Boston clamp: Cameron Appliance Co., Everett, Mass.

Boston compressor: Ajax El. Mfg. Co., Boston, Mass.

Boston hanger: Condit Elec. Mfg. Co., Boston, Mass.

Boston plier: H. K. Porter, 6 Ashland, Everett, Mass.

Bourbon strain ins.: Creaghead Eng. Co., Cincinnati, O.

Bourbonic shade: Macbeth-Evans Glass Co., Pittsburgh, Pa.

Boy Scout flashlights: C. D. Wood Elec. Co., 136 Liberty st., New York, N. Y.

Brascolite lum. units: Luminous Unit Co., St. Louis, Mo.

Break Glass fire alarm: Holtzer-Cabot El. Co., Boston, Mass.

Bright Eye flashlight: Burchwell Mfg. Co., Pontiac Bldg., St. Louis, Mo.

Brightlight lamp: P. Sorensen, Brooklyn, N. Y.

Brilliant vac. cleaner: Sterling Mach. & Stamping Co., Wellington, O.

Brite-Lite floor portable: C. Spiro Mfg. Co., New York.

Britelite lamp: Am. Enamel Co., Providence, R. I.

Broc elec. vehicle: Am. Elec. Car Co., Saginaw, Mich.

Brookduct cond.: Eastern Flex Cond. Co., Brooklyn, N. Y.

Brook potentiometer: Leeds & Northrup Co., Philadelphia, Pa.

Brook steel conduit: Eastern Flexible Conduit Co., Brooklyn, N. Y.

Brouskol carbon brush: H. Reisinger, New York (Imp.).

Brown insulators: Brookfield Glass Co., 2 Rector st., New York, N. Y.

Brownie ins. tape: Boston Woven Hose & Rub. Co., Dept. No. 50, Cambridge, Mass.

Brush ltg. set: C. A. Strelinger Co., Detroit, Mich.

B. S. paint & compound: Mitchell-Rand Mfg. Co., 97 John st., New York, N. Y.

Bsco wet bat.: T. A. Edison, Inc., Orange.

Buckbee tree ins.: W. H. Olmstead Mfg. Co., Detroit, Mich.

Buckeye cond.: Western Conduit Co., Youngstown, O.

Buckeye knob: Findlay Elec. Porcelain Co., Findlay, O.

Buckeye power pumps: Mast, Foos & Co., Springfield, O.

Buckeye tape: Mechanical Rubber Co., Cleveland, O.

Buffalo grip: Western Elec. Co., N. Y.

Bull Dog clamps and comealongs: Lamson & Sessions Co., Cleveland, O.

Trade Names

Bull Dog clamps: Fairmount Elec. & Mfg. Co., Philadelphia, Pa.
Bull Dog coil: Electro Imp. Co., N. Y.
Bull Dog connector: Am. Ever Ready Wks. of Nat'l Carbon Co., Long Island City, N. Y.
Bull Dog guard: McGill Mfg. Co., 39 Oak, Valparaiso, Ind.
Bull Dog loom clip: Christo Mfg. Co., Richmond, Va.
Bull Dog paste: Knoblock-Heideman Mfg. Co., So. Bend, Ind.
Bull Dog switch: Mutual El. & Mach. Co., Wheeling, W. Va.
Bull Dog tape: Boston Woven Hose & Rub. Co., Dept. No. 50, Cambridge, Mass.
Bullock mot. & trans.: Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Bundy clock: International Rec. Co., Endicott, N. Y.
Bungalow portables: Pittsburgh Lamp, Brass & Glass Co., Pittsburgh, Pa.
Burke disconnecting switch: Ry. Indus. Engin. Co., Pittsburgh, Pa.
Burke tool: Ry. & Indus. Engin. Co., Greensburg, Pa.
Burns hearing dev.: Detecta Phone Co. of Am., New York, N. Y.
Burns tel.: Amer. El. Co., Chicago.
Buss auto. & enclosed fuses: Bussman Mfg. Co., St. Louis, Mo.
Butterfly sleet cut: Bayonet Trol. Harp Co., Springfield, O.
Buzzbell: Standard Elec. Utilities Co., New York.
B. X. cable: Sprague Elec. Wks. of G. E. Co., 527 W. 34th, New York.
Byerlite insulation: Beyerley & Son, Cleveland, O.
B. & D. knob: Am. Porcelain Co., E. Liverpool, O.
B. & K. const. material: Barnes & Kobert Mfg. Co., Milldale, Conn.
B. & S. attachment plug: Solar Elec. Co., Chicago, Ill.
Cadet bell & trans.: Edwards & Co., New York, N. Y.
Cadillac vac. clean.: Clements Mfg. Co., Chicago.
Caine box: Elec'l Mfg. Co., Denver.
Calcite glass shades: Steuben Glass Wks., Corning, N. Y.
Calido wire: Elec. Alloy Co., Morristown, N. J.
Calla shade: Holophane Wks. of G. E. Co., Cleveland, O.
Calor heater: Detroit Elec. Heater Co., Detroit, Mich.
Calorel htg. devices: Fearn Co., Baltimore, Md.
Camia shade: Gleason-Tiebout Glass Co., 71 W. 23d st., and Opalux Co., New York.
Campbell flush plugs & receptacles: Steel City Elec. Co., 1207 Columbus ave., Pittsburgh, Pa.
Candee wire & pothead: Okonite Co., New York.
Canteen sign: Solar Elec. Co., Chicago.
Canton trolley base: Trolley Supply Co., Canton, O.
Caoutchouc wire: Simplex Wire & Cable Co., Boston, Mass.
Capitol coil: Nat'l Coil Co., Lansing, Mich.
Card clock: Internat'l Time Rec. Co., Endicott, N. Y.
Carey Foster instruments: Leeds & Northrup Co., Philadelphia, Pa.
Carrara shade: Gleason-Tiebout Glass Co., 71 W. 23d st., and Opalux Co., New York.
Caruco ins. tape: Canfield Rubber Co., Bridgeport, Conn.
Carver tool: American Elec. Tool Co., West Newton, Mass.
Case ltg. outfit: New Britain Mach. Co., New Britain, Conn.
C. B. knobs: National Tele. Supply Co., Cleveland, O.
Ceag mine lamp: Concordia Safety Lamp Co., Pittsburgh, Pa.
Cefco coloring: C. E. Franche & Co., 440 Orleans st., Chicago, Ill.
Celestron lacquer: Chemical Products Co., Boston, Mass.
Cello auto specialties: A. S. Campbell Co., Boston, Mass.
Center Fire spark plug: Milwaukee Auto Specialty Co., Milwaukee, Wis.
Centrifugal vibrator: Sanitarium Equipt. Co., Battle Creek, Mich.
Centurion outfits: Garford Mfg. Co., Elyria, O.
C. G. tape: St. Louis Rubber Cement Co., St. Louis, Mo.
C. H. specialties: Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Challenge imp. plier: Wiebusch & Hilger, Ltd., New York.
Champion battery: Hector MacRae, Baltimore, Md.
Champion blue printing: Keuffel & Esser Co., Hoboken, N. J.
Champion ins'l paint: Chicago Mica Co., Valparaiso, Ind.
Champion Lamps: Cons. El. Lamp Co., Tapleyville Station, Danvers, Mass.
Champion rim and mortise opener: Standard Lock Co., 111 Himrod, Brooklyn, N. Y.
Champion tape: E. W. Manter & Co., 158 Purchase st., Boston, Mass.
Champion vac. clean.: Cyclone Vac. Clean. Co., Bradford, Pa.
Chandeysson motors: Pan Elec. Mfg. Co., St. Louis, Mo.
Chapin fixture: Nat'l Met. Stpg. & Mfg. Co., Newark, N. J.
Chapman arrester: Minneapolis El. Co., Minneapolis, Minn.
Chapman plug: Bryant El. Co., Bridgeport, Conn.
Chapman signal: C. N. Wood Co., Boston, Mass.
Chase nipples: Condit El. Mfg. Co., Boston, Mass.
Chatham tap. mach.: Chattanooga Armature Wks., Chattanooga, Tenn.
Chatham glass shade: United States Glass Co., Pittsburgh, Pa.
Chau-Phone Limousine Tele.: Western Elec. Co., New York, N. Y.
Chatterton's compound: McGill Eng. Co., 39 Oak st., Valparaiso, Ind., and Bishop Gutta Percha Co., New York.
Cheerful radiators: Adams Bros. Mfg. Co., Pittsburgh, Pa.
Chicago automobile: Walker Vehicle Co., Chicago, Ill.
Chicago Grip comealong: M. Klein & Sons, Chicago, Ill.
Chicago rail bonds: American Steel & Wire Co., Chicago, Ill.
Chinalak clear varnish: John C. Dolph Co., Newark, N. J.
Chloride bat.: El. Storage Bat. Co., Phila.
Chromel resistance wire: Hoskins Mfg. Co., Detroit, Mich.
Chubbuck bracket: Elec. Const. Supply Co., Springfield, O.
Circle T specialties: Trumbull El. Mfg. Co., Plainsville, Conn.
Circular Loom flexible conduit: American Circular Looom Co., New York.
Clariphone mouthpiece: Colytt Labor., Chicago, Ill.
Clearcut shade: Holophane Wks. of G. E. Co., Cleveland, O.
Clero auto horn & push buttons: Fitzgerald Mfg. Co., Torrington, Conn.
Cleveland cable hanger: W. T. Norton, West Park, O.
Climax ex bolt: Brohard Co., Phila., Pa.
Climax gas torch: Garrison Brass & Mach. Wks., New York.
Climanx med. bat.: Otto Mfg. Co., Jersey City, N. J.
Climax headlt.: Trolley Supply Co., Canton, Ohio.
Climax flat iron: Reliance Elec. Htg. Co., Columbia, Pa.
Climax wire: Driver-Harris Wire Co., Harrison, N. J.
Clum guy anchor: Falls El. Co., Lima, O.
Cocheco fibre: Spaulding & Sons Co., Tonawanda, N. Y.
Collom holder: H. A. Stiles & Co., Boston, Mass.
Colonial glass shade: United States Glass Co., Pittsburgh, Pa.
Colt sterop. lamp: Keller & Co., N. Y.
Columbia bell: Stanley & Patterson, 23 Murray st., New York, N. Y.
Columbia carbons, batteries, brushes: Nat. Carbon Co., Cleveland, O.
Columbia dent. appl.: Ritter Dental Mfg. Co., Rochester, N. Y.
Columbia fix.: National Metal Stamping & Mfg. Co., Newark, N. J.
Columbia ins.: Brookfield Glass Co., 2 Rector st., New York, N. Y.
Columbia meters: Roller-Smith Co., 203 Broadway, New York, N. Y.
Columbus conduit box: Thomas & Betts Co., 103 Hudson st., New York.
Combat bat.: Commercial Bat. Co., Chicago, Ill.
Comet lock: Blackburn Specialty Co., 1122 Prospect ave., Cleveland, O.
Comet magneto: Henricks Magneto & Elec. Co., Indianapolis, Ind.
Comet plug: Oakes & Dow Co., Boston.
Comfort lamp: McLeod Ward & Co., New York, N. Y.
Comfort light: Runzel-Lenz El. Mfg. Co., Chicago, Ill.
Commonsense time switch: Kennedy-Webster Co., Chicago, Ill.
Compensarc moving picture appliance: Fort Wayne Elec. Wks. of G. E. Co., 1412 Broadway, Fort Wayne, Ind.
Competition annunciator: Partrick & Wilkins Co., Philadelphia, Pa.
Competition bell: Stanley & Patterson, 23 Murray st., New York, N. Y.
Competition tape: N. Y. Insulated Wire Co., 114 Liberty st., New York.
Comstock armature coil formers and presses: Delahunty Dyeing Machine Co., Pittsburgh, Pa.
Condulets: Crouse-Hinds Co., Syracuse.
Conduletto: Crouse-Hinds Co., Syracuse.
Conlon elec. washer: Western Elec. Co., New York, N. Y.
Conservo wood press: S. Cabot, Boston.
Consistency comp.: Warren Lubricant Co., Buffalo, N. Y.
Cooper-Hewitt rectif.: Westinghouse El. & Mfg. Co., E. Pittsburgh, Pa.
Cophite brush: Nat'l Carbon Co., Cleveland.
Copley Senior brush: U. S. Carbon Co., 210 E. 37th st., New York, N. Y.
Cora shade: Cons. Lamp & Glass Co., Corapolis, Pa.
Corinthian post: Flour City Ornamental Iron Wks., Minneapolis, Minn.
Cornell crooks tubes: E. Machlett & Son, New York, N. Y.
Cosmos preservative paint: Durable Mfg. Co., New York, N. Y.
Cosy toaster: Phelps Mfg. Co., Detroit.
Cotelco annunciator: S. H. Couch Co., Norfolk Downs, Mass.
Cotenamel wire: Belden Mfg. Co., 2308 So. Western ave., Chicago, Ill.
Cottonite wire: Acme Wire Co., New Haven, Conn.
Craftsman fix.: G. Stickley & Co., N. Y.
Creoseptine wood presser: Am. Mfg. Co., Minneapolis, Minn.
Crescendo bell: Manhattan Elec'l Supply Co., 17 Park pl., New York, N. Y.
Crescent dish washer: Bromley-Merseles Mfg. Co., New York.
Crescent exp. bolt: F. H. Evans, Brooklyn, N. Y.
Crescent lava: M. Kirchberger & Co., 378 Second ave., New York, N. Y.
Crescent specialties: McGill Mfg. Co., 39 Oak, Valparaiso, Ind.
Cresco mansbridge tel. cond.: Elec. Spec. Co., Cresco, Ia.
Cristoleers: O. E. Friedlaender & Co., New York, N. Y.
Crosby clamp: An. Hoist & Derrick Co., St. Paul, Minn.
Cross tack: James Goldmark, 83 Warren st., New York, N. Y.
Crown bond: American Steel & Wire Co., Chicago, Ill.
Crown cig. ltr.: Standard Mfg. Co., Auburn, Ind.
Crown cut-out: Edwards & Co., New York, N. Y.
Crown ins.: Brookfield Glass Co., 2 Rector st., New York, N. Y.
Crown specialties: Standard Mfg. Co., Bridgeport, Conn.
Crown toaster: Paragon Elec. Co., Chicago, Ill.
Crown wire: American Steel & Wire Co., Chicago, Ill.
C. S. push button: Cutter Co., Phila., Pa.
Cubit auto horn: Nonpareil Horn Mfg. Co., New York.
Curtis portables: National X-Ray Reflector Co., 233 W. Jackson blvd., Chicago, Ill.
Cushing stage ltg.: Condit Elec'l Mfg. Co., Boston, Mass.
Cycle rev. pole: Atwater Mfg. Co., Waukegan, Ill.
Cyclone bell: Schwarze Elec. Co., Adrian, Mich.
Cyclone cutter: Wolf Elec'l Promoting Co., Cincinnati, O.
Cyclone drink mixer, fan and hair driers: Hamilton-Beach Mfg. Co., Racine, Wis.
Cyprus wheel: Brady Brass Co., Jersey City, N. J.
Dad push button: Benjamin Elec. Mfg. Co., 120 S. Sangamon st., Chicago, Ill.
Dads flashlights: Hytees Factories, Inc., Indianapolis, Ind.
Daisy door switches: Cutter Co., Phila.
Daisy floor treads: Ansonia El. Co., Ansonia, Conn.
Da-Lite flashlight: L. P. Halladay Co., Streator, Ill.
Dalite ltg. plant: Miller & Reed, Clay Center, Kans.
Da-Lite ignition outfit: Dayton-Dick Co., Quincy, Ill.
Dalite storage battery: St. Joseph Battery Co., St. Joseph, Mo.
Dalte circuit breakers: Cutter Co., Phila.
Dan-Dee boxes: Erie Art Metal Co., Erie, Pa.
Dana freezer: Peerless Freezer Co., Winchendon, Mass.
Dandy annunciators, bells & floor treads: Samson Elec. Co., Canton, Mass.
Dandy conduit benders: M. B. Austin & Co., 700 Jackson blvd., Chicago, Ill.
Dandy telegraph instruments: J. H. Bunnell & Co., 32 Park pl., New York.
Dandy toast stoves: Waage El. Co., Chicago, Ill.
Darrin switch: Automatic Switch Co., New York, N. Y.
Dauntless tape: Boston Woven Hose & Rubber Co., Dept. No. 50, Cambridge, Mass.
Davidson cable hanger: Reliable Elec. Co., Chicago, Ill.
Davidson disc fans: Mass. Fan Co., Watertown, Mass.
Davis terminals: Standard Underground Cable Co., Pittsburgh, Pa.
Davis & Kidder med. battery: Stanley & Patterson, 23 Murray st., New York.
Daylite lantern: Illuminating Elec. Mfg. Co., Philadelphia, Pa.
Daylight Way asbestos shade: Asbesto-Gleam Mfg. Co., 846 S. Canal st., Chicago, Ill.
Dayton meat slicer: Computing Scale Co., Dayton, O.
Dazlite auto lamp adapters: Harvey Hubbell, Bridgeport, Conn.
Deaco auto appliance: Detroit Elec. Appliance Co., Detroit, Mich.
Deadendeyes clamp: W. N. Matthews & Bro., 3705 Forest Park blvd., St. Louis.
Dean elec. horn: Benjamin Elec. Mfg. Co., 120 So. Sangamon st., Chicago.
Deane pumps: International Steam Pump Co., New York, N. Y.
Deco compound: Du Perow Elec. Co., Washington, D. C.
Deco lamps: Deuth & Co., New York.
Decora glass shade and fixtures: Macbeth-Evans Glass Co., Pittsburgh. ..
Deffone hearing device: Stromberg-Carlson Tel. Mfg. Co., Rochester.
Deflectolier fix.: Elgin (Ill.) Motor Co.
Delco Auto. Ltg. & Star System: Dayton Engineering Laboratories Co., Dayton.
Delica white shade: Pittsburgh Lamp, Brass & Glass Co., Pittsburgh, Pa.
Delta instrument: Foote Pierson & Co., New York, N. Y.
Deltabeston wire & tape: D. & W. Fuse Co., Providence, R. I.
Deltatape tape: D. & W. Fuse Co., Providence, R. I.
De Luxe auto lamp: Badger Brass Co., Kenosha, Wis.
De Luxe sign: T. Cusack Co., Chicago.
Demograph portable moving picture mach.: Phantoscope Mfg. Co., Washigton, D. C.
De Ryeke elevator box: Krantz Mfg. Co., Brooklyn, N. Y.
Dervish fan: Carleton Co., 174 Summer st., Boston, Mass.
Detectophone hearing devices: Boston Talking Mach. Co., Boston, Mass. ..
Detroit auto horn: Roberts, F. C., Detroit, Mich.
Detroit clothes washer: Lodewyck Hydro Motor Co., Detroit, Mich.
Detroit-Elec. vehicles: Anderson Elec. Car Co., Detroit, Mich.
Detroit fireless cooker: Phelps Mfg. Co., Detroit, Mich.
Dey clock: International Time Record.
Dia carbon: Hugo Reisinger, New York.
Diamond dry battery & Christmas tree ltg. outfits: Imporn Sales Co., 19 E. 21st st., New York.
Diamond E conduit fitting: Everhard Mfg. Co., Canton, O.
Diamond Grid storage bat.: Philadelphia Storage Bat. Co., Philadelphia.
Diamond H. switch: Hart Mfg. Co., Hartford, Conn.
Diamond lacquer: American Lacquer Co., Bridgeport, Conn.
Diamond mirror shade: Klemm & Co., Philadelphia, Pa.
Diamond sad iron: Sterling Mach. & Stamping Co., Wellington, O.
Diamond soldering comp.: Burnley Battery & Mfg. Co., North East, Pa.
Diamond vac. clean.: Sterling Machine & Stamping Co., Wellington, O.
Diamond wire: B. F. Goodrich Co., Akron, O.
Dictograph: General Acoustic Co., N. Y.
Di-El-Ite insulating joints and resistance units: Wirt Co., Germantown, Philadelphia, Pa.
Dielectros paint: Dielectric Mfg. Co., St. Louis, Mo.
Dilecto fibre: Continental Fibre Co., Newark, Del.
Dim-a-lite regulating socket: Wirt Co., Germantown, Philadelphia, Pa.
Dinkey rheostat: Elec. Controller & Mfg. Co., Cleveland, O.
Dirigo fibre: Leatheroid Mfg. Co., Kennebunk, Me.
Dirigo insulator: Ohio Brass Co., Mans-
Disc sign: Western Display Co., St. Paul.
Disfico fibre: Diamond State Fibre Co., Bridgeport, Pa.
Dispatchograph Ry. signals: Dispatching Signal Co., Fall River, Mass.
Display-O-Graph: W. A. Harvey, Scranton, Pa.
Dixie specialties: Edwards & Co., New York, N. Y.
Dixon ltg. fixtures: T. C. White Co., St. Louis, Mo.
D'Light portable: Wizard Elec. Lamp Co., San Francisco, Cal.
Dolphin wire: Atlantic Ins. Wire & Cable Co., 120 Liberty st., New York.
Domamo sad iron: Dover Mfg. Co., Canal Dover, O.
Dome bell: Holtzer-Cabot Electric Co., Boston, Mass.
Domelre refrigerator: Mechanical Refrigerator Co., Chicago, Ill.
Donkin cent hour meter: Harbrook Service Co., Pittsburgh, Pa.
Donnelly climber: Blakeslee Forging Co., Plantsville, Conn.
Doric fixture parts: Friedley Voshardt Co., 733 S. Halsted st., Chicago, Ill.
Doric shade: Jefferson Glass Co., Follansbee, W. Va.
Double Eagle specialties: F. H. Lovell & Co., Arlington, N. J.
Double Grip clamp: Lamson & Sessions Co., Cleveland, O.
Double Jet torch: Turner Brass Wks., Sycamore, Ill.
Dostal drop outs: Western Engin. Specialties Co., Denver, Colo.
Dreadnaught gasoline torch: Wall Mfg. Supply Co., 705 Preble ave., Pittsburgh, Pa.
Druid shades: Holophane Wks. of G. E. Co., Cleveland, O.
Dryfield tape: Walpole Tire & Rubber Co., Walpole, Mass.
Duggan cleat: Imperial Porcelain Wks., Trenton, N. J.
Dull's Flasher: Reynolds Dull Flasher Co., Chicago, Ill.
Dumore specialties: Wisconsin Elec. Co., 1635 Junction ave., Racine, Wis.
Duntley tool: Chicago Pneumatic Tool Co., Chicago, Ill.
Duplex arc lamp: Warren Elec. Co., New York, N. Y.
Duplex battery: National Carbon Co., Cleveland, O.
Duplex bolt: Isaac Church, So. Norwalk, Conn.
Duplex chain: Hatheway Mfg. Co., Bridgeport, Conn.
Duplex cleaner: Ramey Co., Chillicothe, Ohio.
Duplex connector: Bliss-Chester Co., 31 Mathewson st., Providence, R. I.
Duplex hair drier: Math. Thome, Chicago, Ill.
Duraduct conduit: Tubular Woven Fabric Co., Pawtucket, R. I.
Durax bushing: F. H. Lovell & Co., Arlington, N. J.
Duretta fixtures: G. E. Walter, New York.
Duro cord tips: C. H. McEvoy, Lowell, Mass.
Duro-Glaze portable: Turchin Co., New York, N. Y.
Duro storage battery: Vivax Storage Battery Co., Chicago, Ill.

Trade Names

Dyer line material: Chester Ry. Supply Co., Chester, Pa.

Dynalux auto wiring & ltg.: Garford Mfg. Co., Elyria, O.

D-X bridle ring: Diamond Expansion Bolt Co., New York.

D. & L. Specialties: Farr Tel. & Const. Sup. Co., Chicago, Ill.

D. & T. Guy anchors: Gund Mfg. Co., 320 Jay st., La Crosse, Wis.

Eagle wire: Marion Ins. Wire & Rubber Co., Marion, Ind.

Earll trolley pole catch: Lord Mfg. Co., Brooklyn, N. Y.

Easiest Way ltg. outfit: Gudeman & Co., New York.

Easy bolt clipper: H. K. Porter, 6 Ashland st., Everett, Mass.

Easy clothes washer: Dodge & Zuill, Syracuse, N. Y.

Easy lamp changer and cord adjuster W. N. Matthews & Bro., 5700 Forest Park blvd., St. Louis, Mo.

Easy storage bat. cutter: H. K. Porter, 6 Ashland st., Everett, Mass.

Easylite socket attachment: A. E. Rittenhouse Co., Honeoye Falls, N. Y.

E. B. B. iron wire. Indiana Steel & Wire Co., Muncie, Ind.

Eclipse annunciators. Moon Mfg. Co., Chicago, Ill.

Eclipse bell: P. R. Mfg. Co., 621 Bellevue ave., Detroit, Mich.

Eclipse clothes washer: Fairbanks, Morse & Co., Chicago, Ill.

Eclipse cord adjuster: J. W. Canter & Co., Abilene, Texas.

Eclipse fans and motors: Fidelity Elec. Co., Lancaster, Pa.

Eclipse flashlight: Universal Novelty Co., New York.

Eclipse inst.: Eldridge Elec. Mfg. Co., 39 P. O. Sq., Springfield, Mass.

Eclipse inst.: Weston Elec'l Instrument Co., Newark, N. J.

Eco bell & door switch: Edwards & Co., New York, N. Y.

Economic induction coil: New York Coil Co., New York, N. Y.

Economy arc lamp: M. J. Wohl & Co., Brooklyn, N. Y.

Economy bracket: Geo. Cutter Co., 411 Notre Dame, So. Bend, Ind.

Economy bat. holder: H. A. Stevens, Boston, Mass.

Economy conduit: National Metal Molding Co., 1107 Fulton Bldg., Pittsburgh.

Economy house pump: Thomas & Smith, Chicago, Ill.

Economy socket attachment: Harvey Hubbell, Bridgeport, Conn.

Economy vacuum cleaners: Pittsburgh Gage & Supply Co., Pittsburgh, Pa.

Eden clothes washer: Brokaw-Eden Mfg. Co., Chicago, Ill.

Edison-Brown rail bond: Harold P. Brown, New York.

Edison insulator: Brookfield Glass Co., 2 Rector st., New York, N. Y.

Edison spark plug: Jeffery Dewitt Co., Detroit, Mich.

E. E. B. canopy insulator: E. E. Bechtold, 1928 Wabash ave., Chicago, Ill.

Ecco magnetmeter: Le Munyon & Bidelman, Los Angeles, Cal.

Eichhoff wire reel: Mathias Klein & Sons, Chicago.

Ekla bell: P. R. Mfg. Co., 621 Bellevue ave., Detroit, Mich.

Eklips spark plug: Fulton Co., Milwaukee, Wis.

Elba storage bat.: Willard Storage Battery Co., Cleveland, O.

El Bollo heater: Hot Point El. Htg. Co., Ontario, Cal.

El Chafo chafing dish: Hot Point Elec. Htg. Co., Ontario, Cal.

El Comfo htg. pad: Hot Point El. Htg. Co., Ontario, Cal.

Elco pocket meter: Eldredge Elec. Mfg. Co., 93 P. O. Square, Springfield, Mass.

El Dorado htg. pad: L. B. Lincoln Elec. Wks., 112 W. Adams st., Chicago, Ill.

Eleck-Trick vulcanizer: Jas. L. Gibney & Bros., Philadelphia, Pa.

Electra carbon: Hugo Reisinger, N. Y.

Electra horn: Automobile Supply Mfg. Co., Brooklyn, N. Y.

Electra pistol & cigar lighter: Import Sales Co., 19 E. 21st st., New York.

Elec. Black paint & compound: Mitchell-Rand Mfg. Co., 97 John st., New York, N. Y.

Elec. Lady: Michigan Washing Mach. Co., Muskegon, Mich.

Elec. soldering comp.: J. F. Walsh Co., Pittsfield, Mass.

Elec. Star auto lamp: Milwaukee Bronze Casting Co., Milwaukee, Wis.

Electrobator incubator: Cyphers Incubator Co., Buffalo, N. Y.

Electrobestos insulation: H. W. Johns-Manville Co., New York, N. Y.

Electroduct conduit: American Circular Loom Co., New York, N. Y.

Electrofier auto adapter: Frank W. Morse, Boston, Mass.

Electrogrip lamp adjuster: Yost Elec. Mfg. Co., Toledo, O.

Electrohens incubator: Cyphers Incubator Co., Buffalo, N. Y.

Electroid insulation: Scranton Button Co., Scranton, Pa.

Electrolet conduit fitting: Killark Elec. Mfg. Co., St. Louis, Mo. (W. Douglas Woolley, General Sales Representative, 30 N. Michigan blvd., Chicago, Ill.

Electrophone hearing dev.: Stolz Electrophone Co., Chicago, Ill.

Electrotonic med. battery: Stanley & Patterson, 23 Murray st., New York.

El Ergo egg steamer: Hot Point Elec. Htg. Co., Ontario, Cal.

Elektoy toys: J. K. Osborn Mfg. Co., Harrison, N. J.

Elekrik Kloks: Betts & Betts Corporation, 258 West 55th st., New York.

Elektro water heater: D. C. Hughes & Co., Chicago, Ill.

Elektron horn: O'Brien Electrophone Co., Hallowell, Me.

Elephant: Phosphor-Bronze Smelting Co., Philadelphia, Pa.

El Glostovo stove: Hotpoint Elec. Htg. Co., Ontario, Cal.

Elk battery: Stackpole Carbon Co., St. Mary's, Pa.

Elmo clothes washer: Grinnell Wash. Mach. Co., Grinnell, Ia.

El Perco percolator: Hot Point Elec. Htg. Co., Ontario, Cal.

El Radio radiators: Hot Point Elec. Htg. Co., Ontario, Cal.

Elreco poles: Electric Railway Equipment Co., Cincinnati, O.

El Stovo disc stove: Hot Point Elec. Htg. Co., Ontario, Cal.

El Teballo pots: Hot Point Elec. Htg. Co., Ontario, Cal.

El Tosto toaster: Hot Point Elec. Htg. Co., Ontario, Cal.

El Warmo foot warmer: Hot Point Elec. Htg. Co., Ontario, Cal.

Emco heating devices: Elec. Mfg. Co., San Francisco, Cal.

Emco openers & locks: Edwards & Co., New York, N. Y.

Ememtap moulding: S. Robert Schwartz & Bro., New York.

Emeralite shade & portables: H. G. McFadden & Co., New York.

Emery tripods: Fairmount Elec. & Mfg. Co., Philadelphia.

Empire cloth: Mica Insulator Co., 68 Church st., New York, N. Y.

Empire cond. rod: Diamond Expansion Bolt Co., New York.

Empire min. lamp: H. W. McCandless & Co., 67 Park pl., New York.

Enamelac paint: Walpole Tire & Rubber Co., Walpole, Mass.

Enamelduct conduit: National Enameling & Mfg. Co., Youngstown, O.

Enamelite magnet wire: Acme Wire Co., New Haven, Conn.

Enduro spark coil: American Elec'l Wks., Phillipsdale, R. I.

Engineers' wire: Electric Cable Co., New York, N. Y.

Enos fixture: Edward Schroeder Lamp Wks., New York.

Entz auto lighting and starting: Adams-Bagnall Elec. Co., Cleveland, O.

E. O. storage bat.: John F. Esser, N. Y.

Equalite glassware: Bagley & Sons, Brooklyn, N. Y.

Equipoise tele. bracket: Holtzer-Cabot Elec. Co., Boston, Mass.

Erickson bushing: Bossert Co., Utica.

Erickson coupling: Thomas & Betts Co., 105 Hudson st., New York.

Espersen Lights & Signs: Pacific Elec. Co., La Crosse, Wis.

Etco switchboards: Elec'l Testing Co., 352 Knoxville ave., Peoria, Ill.

Etonial annunciator: Edwards & Co., New York, N. Y.

Eureka air pump: Bishop-Babcock-Becker Co., Cleveland, O.

Eureka auto lock: Blackburn Specialty Co., 1122 Prospect ave., Cleveland.

Eureka bell: Ansonia Elec'l Co., Ansonia, Conn.

Eureka garage pump: A. Loppacker Auto Mach. Wks., Bloomfield, N. J.

Eureka guard: Frank W. Morse, Boston.

Eureka headlight: Dayton Mfg. Co., Dayton, O.

Eureka ice cream freezer: V. Clad & Sons, Philadelphia, Pa.

Eureka magneto: Henricks Magneto & Elec. Co., Indianapolis, Ind.

Eureka soldering comp.: Glasselli Chem. Co., Cleveland, O.

Eureka switch: Frank W. Morse, Boston, Mass.

Eureka tape: St. Louis Rubber Cement Co., St. Louis, Mo.

Eureka wire connector: Frank W. Morse, Boston, Mass.

Everbrite globe letters: Chicago Glass Novelty Co., Marion, Ind.

Eveready specialties: Am. Ever Ready Wks. of Nat'l Carbon Co., Long Island City, N. Y.

Everett blue printing: Revolute Mach. Co., New York, N. Y.

Ever-Ready adjustable fix.: T. D. Hill & Co., Philadelphia, Pa.

Excello battery: Clark & Mills Elec. Co., Cambridge, Mass.

Excello arc lamp: Kandem Elec. Co., New York.

Excello resistance wire: H. Boker & Co., New York.

Excelsior battery: Waterbury Battery Co., Waterbury, Conn.

Excelsior ice cream freezer: C. Clad & Sons, Philadelphia, Pa.

Excelsior mica: Meirowsky Bros., 106 Broadway, Jersey City, N. J.

Excelsior soldering comp.: Manhattan Elect'l Supply Co., 17 Park pl., New York, N. Y.

Excelsior trolley wheel: International Register Co., Chicago, Ill.

Excess Indicator: Pittsburgh Elec. Specialty Co., Pittsburgh, Pa.

Exeter dry battery: Stanley & Patterson, 23 Murray st., New York, N. Y.

Exide storage bat.: Electric Storage Bat. Co., Philadelphia, Pa.

Express blue printing: Williams, Brown & Earle, Philadelphia, Pa.

Express Tele.: Kellogg Switchboard & Supply Co., Chicago, Ill.

E. Z. Lamp Lock: Frederick Rall, New York, Sole Selling Agent: E. Z. Mazda Lamp Lock Co., New York.

Falcon fire alarms: J. H. Bunnell & Co., 32 Park pl., New York, N. Y.

Falcon wrenches: Yost Elec. Mfg. Co., Toledo, O.

Fansteel sad iron: J. H. Cummings & Co., Chicago, Ill.

Faraday bells: Stanley & Patterson, 23 Murray st., New York, N. Y.

Faradmeter inst.: Foote, Pierson & Co., New York, N. Y.

Farieslite ltg. fix.: Faries Mfg. Co., Decatur, Ill.

Farrand inst.: Leeds & Northrup Co., Philadelphia, Pa.

Faultless inc. lamp coloring: Agens & Co., Newark, N. J.

Faultless clothes washer: La Crosse Washer Co., La Crosse, Wis.

Faultless Wax: Candy & Co., Chicago, Ill.

Favorite sad iron: Dover Mfg. Co., Canal Dover, O.

Federal blue printing: Keuffel & Esser Co., Hoboken, N. J.

Federal Cesco starter: Chicago (Ill.) Elec. Specialties Co.

Fein drill: J. L. Gleason & Co., Boston.

Felton's coupling: Harold L. Bond Co., Boston, Mass.

Femco lamp: Franklin Elec. Mfg. Co., Hartford, Conn.

Ferlux glass shade: Max Schaffer Co., 26 Warren st., New York, N. Y.

Ferret fault finder: Elec. Specialty Mfg. Co., Cedar Rapids, Ia.

Fessenden wireless inst.: National Elec. Signaling Co., Brooklyn, N. Y.

Feussner multi-range shunt: James G. Biddle, 1211 Arch, Philadelphia.

Fibreo socket lining: C. L. Sherman, Philadelphia, Pa.

Fibroid tape: H. W. Johns-Manville Co., New York, N. Y.

Fielding rosette: H. T. Paiste Co., Philadelphia, Pa.

Fielding box: Stanley & Patterson, 23 Murray st., New York, N. Y.

Fine Light clock: Darche Mfg. Co., Chicago, Ill.

Fire Ball coil: New York Coil Co., N. Y.

Fire Chief projectors: Kenyon Searchlight Co., Detroit, Mich.

Fire Fly storage bat.: Hoosier Storage Battery Co., Evansville, Ind.

Fireite resistance coil cores: Hartford Faience Co., Hartford, Conn.

Firefly flasher: C. O. Schneider & Co., Chicago, Ill.

Fire Out fire extinguisher: Inst. Lighter Co., Columbus, O.

Fisher auto wiring & ltg.: Elec. Auto-Lite Co., South Bend, Ind.

Fisher cable test: Leeds & Northrup Co., Philadelphia, Pa.

Flack tele. muffler: Smith Selling & Advertising Co., Philadelphia, Pa.

Flam-Bo unit fix.: Post-Glover Elec. Co., Cincinnati, O.

Flash-I-Do sign: Lindstrom-Smith Co., 1100 S. Wabash ave., Chicago, Ill.

Fleur-De-Lis battery: French Battery & Carbon Co., Madison, Wis.

Flexclamp clamp: Novelty Elec. Co., Philadelphia, Pa.

Flexduct conduit: National Metal Moulding Co., 1107 Fulton Bldg., Pittsburgh.

Flexilux lamp: Lux Mfg. Co., Terminal Bldg., Hoboken, N. J.

Flexilyte portable: L. A. Williamson Co., New York.

Flexite paint: Standard Paint Co., Woolworth Bldg., New York, N. Y.

Flexo desk light: T. R. Almond Mfg. Co., Ashburnham, Mass.

Flexo htg. pad: Phelps Mfg. Co., Detroit, Mich.

Flexo socket attachment: Peerless Light Co., Peerless Bldg., Chicago, Ill.

Flexsteel cable: National Metal Moulding Co., 1107 Fulton Bldg., Pittsburgh.

Flextube conduit: National Metal Molding Co., 1107 Fulton Bldg., Pittsburgh.

Florence med. bat.: Whitall Tatum & Co., Philadelphia, Pa.

Florentine shade: Gleason-Tiebout Glass Co., 71 W. 23d st., New York, N. Y.

Fluto socket: Pass & Seymour, Inc., Solvay, N. Y.

F. M. hanger: Fee & Mason, New York.

Fobl fault finder: Liebert & Meyerhof, New York (Imp.).

Foen hair drier: Sanax Co., New York.

Foldolite fixtures: Beardslee Chandelier Mfg. Co., 237 S. Jefferson st., Chicago, Ill.

Fordorn horn: Benjamin Elec. Mfg. Co., 120 S. Sangamon st., Chicago, Ill.

Fort Pitt time switch: Wilkinsburg Mach. Co., Wilkinsburg, Pa.

Foster stoves: Lindstrom, Smith Co., 1100 S. Wabash ave., Chicago, Ill.

Fostoria shade: Holophane Wks. of G. E. Co., Cleveland, O.

Fountain conduit box: Bierman-Everett Foundry Co., Irvington, N. J.

Fountainlight flashlight: Beacon Miniature Elec. Co., 118 Duane st., New York, N. Y.

F-P ltg. plants: Incandescent Light & Stove Co., Cincinnati, O.

Frahm instruments: James G. Biddle, 1211 Arch st., Philadelphia, Pa.

Fraley vibrator: Schunk & Ogg, N. Y.

Franco coloring: C. E. Franche & Co., 440 Orleans st., Chicago, Ill.

Franco specialties: Interstate Elec. Novelty Co., 29 Park pl., New York.

Franklin blue printing: Williams, Brown & Earle, Phila., Pa.

Franklin high tension specialties: Philadelphia Electric Co. Supply Department, 132 S. 11th st., Philadelphia, Pa.

Franklin zincs: Grasselli Chemical Co., Cleveland, O.

Frary auto gas burner: Motor Specialty Co., Waltham, Mass.

Freas laboratory incubators: Eimer & Amend, New York, N. Y.

Fredro glass shade: Oscar Friedlander, New York.

Friar's lantern: Beacon Miniature Elec. Co., 118 Duane st., New York.

Frick elec. clock: Landis Engineering & Mfg. Co., Waynesboro, Pa.

Frink fixture: H. W. Johns-Manville Co.

Frontlite inc. lamp: Sterling Elec. Lamp Div. National Lamp Wks. of General Electric Co., Warren, O.

Frye's plier: Van Cleff Co., New York.

Fullman conduit specialties: Steel City Elec. Co., 1207 Columbus ave., Pittsburgh, Pa.

Fusette plug and cut-outs: H. T. Paiste Co., Philadelphia, Pa.

Fryite extinguisher: Advance Sales Corp., New York, N. Y.

Galloway torch: Otto Berns, Newark, N. J.

Gales compound: K. McLennan & Co., Chicago, Ill.

Gal-Far med. battery: Leon W. Pullen Co., Philadelphia, Pa.

Galvaduct conduit: Safety Armorite Conduit Co., Bailey Farrell Bldg., Pittsburgh, Pa.

Galvanite conduit: American Conduit Mfg. Co., Keystone Bldg., Pittsburgh, Pa.

Gardiner fire alarm box: Gamewell Fire Alarm Telegraph Co., Newton Upper Falls, Mass.

Garland sad iron and ranges: Michigan Stove Co., Detroit, Mich.

Garton-Daniels pick-ups: Elec. Service Supplies Co., Philadelphia, Pa.

Gee Vee clamp: Gillette-Vibber Co., New London, Conn.

Gee Whiz combination tool: Stow Mfg. Co., Binghamton, N. Y.

Gem adjuster: M. B. Austin & Co., 70v Jackson blvd., Chicago, Ill.

Gem beer pump: Kurt Sorge, New York.

Gem box: Chicago (Ill.) Fuse Mfg. Co.

Gem floor box: Krantz Mfg. Co., Brooklyn, N. Y.

Gem decorative ltg.: Gibson Elec. Mfg. Co., 632 Arch st., Philadelphia, Pa.

Gem furnace: Burgess Soldering Furnace Co., Columbus, O.

Gem switch: Gordon Elec. & Mfg. Co., Chicago, Ill.

Gem torch: Turner Brass Wks., Sycamore, Ill.

G-E specialties: General Elec. Co., Schenectady, N. Y.

Gerhard dental appliance: Howard Co., Canton, O.

German-American brush: James Goldmark, New York, N. Y.

Geyser dish washer: Western Electric Co., New York.

GFE alarm bell: General Fire Extinguisher Co., Providence, R. I.

G. G. Gray tape: St. Louis Rubber Cement Co., St. Louis, Mo.

Giant clothes washer: Upton Machine Co., St. Joseph, Mich.

Giant paint: Standard Paint Co., Woolworth Bldg., New York, N. Y.

Gibbs trailer connector: Loeffelholz & Co., Milwaukee, Wis.

Gibraltar tape: M. W. Dunton Co., Providence, R. I.

Gibraltar tape: St. Louis Rubber Cement Co., St. Louis, Mo.

Giggle vibrator: Coates Clipper Mfg. Co., Worcester, Mass.

Gil-Bo adapter: Metal Specialties Mfg. Co., 748 W. Monroe st., Chicago, Ill.

Gilbert shades and holders: Lensed Elec. Shade Co., 101 Warren st., New York.

Gilgen fuse: Central Tele. & Elec. Co., 310 No. 11th st., St. Louis, Mo.

Girdo elec. furnace: C. W. Leavitt & Co., New York, N. Y.

Gladiator asbestos: New Jersey Asbestos Co., Camden, N. J.

Glassine linen and transparent paper shades: Century Equipt. Co., N. Y.

Gletieco shade: Opalux Co., New York.

Globe battery: National Carbon Co., Cleveland, O.

Globe bell: Stanley & Patterson, 23 Murray st., New York, N. Y.

Globe headlight: Trolley Supply Co., Canton, O.

Globe wire: American Steel & Wire Co., Chicago, Ill.

Glo-Lite desk light: Cassidy & Son Mfg. Co., New York.

G. M. Asphaltum paint and varnish: Mitchell-Rand Mfg. Co., 97 John st., New York.

Goehr insulation cutter: Mathias Klein & Sons, Chicago.

Goehst plier: Mathias Klein & Sons, Chicago, Ill.

Gold Medal compound: Le Valley Vita Carbon Brush Co., New York.

Trade Names

Gold Seal tape: Walpole Tire & Rubber Co., Walpole, Mass.
Golden Glow headlights: Esterline Co., Indianapolis, Ind.
Golden Rod vac. cleaner: Hugro Mfg. Co., Warsaw, Ind.
Golinak insulation: Vulcanized Products Co., Muskegon, Mich.
Gonda battery: Leclanche Battery Co., New York, N. Y.
Goodell boring tool: H. H. Mayhew Co., Shelburne Falls, Mass.
Goodridge plier: Mathias Klein & Sons, Chicago, Ill.
Goodson terminals: Graham Mfg. Co., Providence, R. I.
G. P. paint and varnish: Standard Varnish Wks., 100 William st., New York.
Grand washer: Davenport Wash. Mach. Co., Davenport, Ia.
Graphold brush: National Carbon Co., Cleveland, O.
Gray Armature tape: St. Louis Rubber Cement Co., St. Louis, Mo.
Greeley inst.: Foote, Pierson & Co., N. Y.
Greenfielduct conduit: Sprague Electric Wks. of G. E. Co., 527 W. 34th st., New York, N. Y.
Greens magnet wire: Standard Underground Cable Co., Pittsburgh, Pa.
Greer fuse: Harvard Elec. Co., Chicago.
Grimshaw wire & tape: N. Y. Ins. Wire Co., 114 Liberty st., New York.
Gripson guard: McGill Mfg. Co., 39 Oak st., Valparaiso, Ind.
Griptite clamp: Novelty Elec. Co., Philadelphia, Pa.
Grundy shaft coupling: Chas. Bond Co., Phila., Pa.
Guarantee annunciator: Partrick & Wilkins Co., Philadelphia, Pa.
Gummon insulation: Hemming Mfg. Co., Garfield, N. J.
G. V. Fitting: Gillette-Vibber Co., New London, Conn.
Gyite paints and compounds: Insulatine Co., New York.
Gyrofan fan: Adams-Bagnall Elec. Co., Cleveland, O.
G. & E. boring tool: A. B. Rover, Binghamton, N. Y.
Halcun wireless inst.: Haller-Cunningham Elec. Co., San Francisco.
Hall Lamp: Capital Elec. Co., Denver.
Ham socket attachment: Harvey Hubbell, Bridgeport, Conn.
Hancock switch: A. & J. M. Anderson Mfg. Co., Boston, Mass.
Handi-Swan connector: Chicago Electric Mfg. Co., Chicago, Ill.
Handy Andy elec. heater: Acme Elec. Heater Co., Detroit, Mich.
Handy auto specialties: Chicago Elec. Mfg. Co., Chicago, Ill.
Handy cord adjuster and manipulator: Frank W. Morse, Boston, Mass.
Handy travelers iron: Phelps Mfg. Co., Detroit, Mich.
Happy sad iron: Detroit Elec. Heater Co., Detroit, Mich.
Harding socket attachment: Harvey Hubbell, Bridgeport, Conn.
Hargrave tools: Cincinnati Tool Co., Cincinnati, O.
Harpoon anchor: Crouse-Hinds Co., Syracuse, N. Y.
Harter Wireless Cluster: Benjamin Elec. Mfg. Co., 190 S. Sangamon st., Chicago, Ill.
Hartford switches: Hart Mfg. Co., Hartford, Conn.
Harvard guard and cable hanger: Frank W. Morse, Boston, Mass.
Harvard storage battery: Am. Storage Battery Co., Cambridge, Mass.
Havanna shade: Pittsburgh Lamp, Brass & Glass Co., Pittsburgh, Pa.
Haven's comealongs: Mathias Klein & Sons, Chicago.
Hazel elec. pump: Columbus Pump Supply Co., Columbus, O.
H. E. fan: Hunter Fan & Motor Co., 114 Liberty st., New York.
Hear-A-Phone: Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y.
Helland toggle blot: Garrison Brass & Mach. Works, New York, N.Y.
Heinz adjuster: Advance Mfg. Co., Pittsburgh, Pa.
Heinz screwdriver: Advance Mfg. Co., Pittsburgh, Pa.
Heins socket repairing: Advance Mfg. Co., Pittsburgh, Pa.
Heinze clamp: Advance Mfg. Co., Pittsburgh, Pa.
Hel-fi spark plug: Motor Accessories Co., Marshalltown, Ia.
Hello battery: Stackpole Carbon Co., St. Marys, Pa.
Hellon toaster & disc stove: Pittsburgh Elec. Specialty Co., Pittsburgh, Pa.
Helios storage battery: Nat'l Carbon Co., Cleveland, O.
Helm battery: H. Wilhelm, 70 Frost st., Brooklyn, N. Y.
Helmet shade: Nat'l X-Ray Reflector Co., 223 W. Jackson blvd., Chicago, Ill.
Hemafam cloth cutter: Wildman Mfg. Co., Norristown, Pa.
Hemera carbons: Hugo Reisinger, N. Y.
Hemit insulation: Hemming Mfg. Co., Garfield, N. J.
Hendee brackets: Line Material Co., So. Milwaukee, Wis.
Hercules comealong: E. L. Sawyer, Millers Falls, Mass.
Hercules spring wire: C. Newman Wire Co., New York, N. Y.
Hercules strain insulator: Electric Railway Equipment Co., Cincinnati, O.
Hercules wire: Driver-Harris Wire Co., Harrison, N. J.
Hess fire alarm panel board: Metropolitan Elec. Protective Co., 130 W. 26th st., New York, N. Y.
H. H. W. test connector: Fairmount Elec. & Mfg. Co., Philadelphia, Pa.
H. P. meter seals and remote control switch: Palmer Elec. & Mfg. Co., Boston, Mass.
Hiawatha guy anchor: Hallett Iron Wks., Harvey, Ill.
Hibbard insulator: Brookfield Glass Co., 2 Rector st., New York, N. Y.
Hickey rectifier: Como Elec'l Co., Spring Lake, N. J.
Hickley's Hiko compound: Como Elec'l Co., Spring Lake, N. J.
Hicko soldering stick: Como Elec'l Co., Spring Lake, N. J.
Higrade tape: E. W. Manter & Co., 158 Purchase st., Boston, Mass.
Hi-Lo horn: Premier Elec. Co., Chicago.
Hipcoscope Elec. hand lantern: Hipwell Mfg. Co., Pittsburgh, Pa.
Hitenso wire: American Brass Co., Waterbury, Conn.
Hi-Ten cross arm: Hubbard & Co., Pittsburgh, Pa.
Hi-Tonsit moulded insulation: Boonton Rubber Mfg. Co., Boonton, N. J.
Hi-Test and Hi-Voltage gloves: Faultless Rubber Co., Ashland, O.
Hi-Up battery: Manhattan Elec'l Supply Co., 17 Park pl., New York.
H-C connector: Holtzer-Cabot Elec. Co., Boston, Mass.
Hobo storage battery: Hoosier Storage Bat. Co., Evansville, Ind.
Hold Heet htg. devices and cement: National Electric Co., 149 W. Austin ave., Chicago, Ill.
Holdfast guard: W. N. Matthews & Bro., 3705 Forest Park blvd., St. Louis, Mo.
Holly htg. system: Am. District Steam Co., N. Tonawonda, N. Y.
Holmes tree insulator: High Tension Elec'l Specialty Co., Newton, Mass.
Holophane-D'Olier shade: Holophane Wks. of G. E. Co., Cleveland, O.
Home Maid sad iron: L. B. Lincoln Elec. Wks., 112 W. Adams st., Chicago, Ill.
Home med. battery: J. H. Bunnell & Co., 32 Park pl., New York.
Home med. battery: Manhattan Elec'l Supply Co., 17 Park pl., New York.
Homelite plant: Garford Mfg. Co., Elyria, O.
Hoopes conductivity bridge: Leeds & Northrup Co., Philadelphia, Pa.
Hoosier pump: Flint & Walling Mfg. Co., Kendallville, Ind.
Hopkins tachometer: Elec. Speedometer Co., Washington, D. C.
Hot Blast torch: Turner Brass Works, Sycamore, Md.
Hot Spark battery holder: Thomas Mfg. Co., C. A., Auburn, N. Y.
Household med. battery: Manhattan Elec'l Supply Co., 17 Park pl., New York, N. Y.
Houston vac. clean.: American Radiator Co., Chicago, Ill.
H-P cable hanger: H. P. Copeland, New York.
H. P. specialties: Palmer Elec. & Mfg. Co., Franklin and Congress sts., Boston, Mass.
Hub annunciator: Samson Elec. Co., Canton, Mass.
Hub push button: Samson Elec. Co., Canton, Mass.
Hub-Dome bell: Holtzer-Cabot Elec. Co., Brookline, Mass.
Hubbell storage bat.: Portable Elec. Safety Light Co., Newark, N. J.
Hubler-Dayton storage battery: Dayton Elec'l Mfg. Co., Dayton, O.
Hurricane fan: Eck Dynamo & Motor Co., Belleville, N. J.
H. W. W. wire connector: Fairmount Elec. & Mfg. Co., Philadelphia, Pa.
Hy-Boil-Oil preservative: German Products Ass'n, St. Louis, Mo.
Hycap-Exide storage bat.: Elec. Storage Bat. Co., Philadelphia, Pa.
Hydro-Ground: Lord Mfg. Co., B'klyn.
Hydro-Ground: L. S. Brach Sup. Co., Newark, N. J.
Hydro-Proof tape: Elkhart Rubber Wks., Elkhart, Ind.
Hydroline Asphalt insulation: Sun Co., Philadelphia, Pa.
Hygrosse humidifier: Briggs, Schaffner & Co., Winston-Salem, N. C.
Hy-Lo lamp: Economical Elec. Lamp Div., Nat'l Lamp Wks., of G. E. Co., New York.
Hypostat tel. specialties: Royal Elec. Supply Co., Sidney, O.
Hyray inc. lamp: Metalyte Co., New York.
Hyray storage battery: Elec. Storage Battery Co., Philadelphia, Pa.
H. & H. switch: Hart & Hegeman Mfg. Co., Hartford, Conn.
H. & H. transformer: Marathon Theatre Stores Co., Wausau, Wis.
H. & L. plug: H. T. Paiste Co., Philadelphia, Pa.
H. & M. branch blocks: Trumbull Elec. Mfg. Co., Plainville, Conn.
I-C controlling device: Independent Elec. Mfg. Co., Milwaukee, Wis.
I-Comfort shade: Nat'l X-Ray Reflector Co., 223 Jackson blvd., Chicago, Ill.
Ideal air compressor: Wappler Elec. Mfg. Co., New York, N. Y.
Ideal alternating gong: R. Haas Elec. & Mfg. Co., Springfield, Ill.
Ideal catcher: Trolley Supply Co., Canton, O.
Ideal clothes washer: Haag Bros. Co., Peoria, Ill.
Ideal dental sterilizers and spraying outfits: Ransom & Randolph Co., Toledo, O.
Ideal floor tread: Renim Specialty Co., Boston, Mass.
Ideal fuses and strips: A. F. Daum Co., Pittsburgh, Pa.
Ideal gong: Electric Appliance Co., Chicago, Ill.
Ideal ground clamp: Frederick Rall, New York.
Ideal heat sad iron: Loetscher-Ryan Mfg. Co., 90 Salina st., Dubuque, Ia.
Ideal knob and cleat: Star Porcelain Co., Trenton, N. J.
Ideal oil lamp burner: Plume & Atwood, Waterbury, Conn.
Ideal panel board and vibrators: Haas Elec. & Mfg. Co., Springfield, Ill.
Ideal port. tool: Neil & Smith Elec. Tool Co., Cincinnati, O.
Ideal wire: Electrical Alloy Co., Morristown, N. J.
Ideal shade: Frank W. Morse, Boston.
Ideal stoves: National Stamping & Elec. Wks., Chicago, Ill.
Ideal tape: Mechanical Rubber Co., Cleveland, O.
Ideal trolley wheel: Lumen Bearing Co., Buffalo, N. Y.
Idealite fixtures: Geo. Cutter Co., 411 Notre Dame st., So. Bend, Ind.
Illinois ohmmeter: Sandwich (Ill.) El. Co.
Imp. torch: Carleton Co., 174 Summer st., Boston, Mass.
Imperial bell: Manhattan Elec'l Supply Co., 17 Park pl., New York.
Imperial guard: McGill Mfg. Co., 39 Oak st., Valparaiso, Ind.
Imperial lamp replacer: E. B. Latham & Co., 4 Murray st., New York.
Imperial paste & salt: Ruby Chemical Co., Columbus, O.
Imperial shade: Unique Art Glass & Metal Co., Brooklyn, N. Y.
Imperial soldering comp.: Standard Chemical Co., Cincinnati, O.
Imperial tele. bracket: Stanley & Patterson, 23 Murray st., New York.
Imperial wire: Crescent Insulated Wire Co., Trenton, N. J.
Impregnite comp.: Dielectric Mfg. Co., St. Louis, Mo.
Improved battery: E. J. Tardie, N. Y.
Improved Protector guard: McGill Mfg. Co., 39 Oak st., Valparaiso, Ind.
Incomparable soldering comp.: Reade Mfg. Co., Hoboken, N. J.
India collapsible lamp: Rose Bros. & Co., Lancaster, Pa.
Inductor-Compensator moving picture lamp: Bell & Howell Co., Chicago.
Inline coloring: Pacific Elec. Co., La Crosse, Wis.
Innovate adjuster: McGill Mfg. Co., 39 Oak st., Valparaiso, Ind.
Insto vibrator: Siebert-Welch Co., Massillon, O.
Insulac varnish: Walpole Tire & Rubber Co., Walpole, Mass.
Insulate composition: General Insulate Co., 1010 Atlantic ave., Brooklyn, N. Y.
Intaglio shades: Gleason-Tiebout Glass Co., 71 W. 23d st., New York, N. Y.
Int'n'l inst.: Hoskins Mfg. Co., Detroit
Invalux shade: Macbeth-Evans Glass Co., Pittsburgh, Pa.
Invincible motors: Century Elec. Co., 19th, Pine and Olive sts., St. Louis.
Invincible toll box: Grueber-Entriken Mfg. Co., Philadelphia, Pa.
Invincible wire: Electric Cable Co., N. Y.
Ionic lamp post: Western Gas Const. Co., Ft. Wayne, Ind.
Irco tape: Imperial Rubber Co., N. Y.
Iridile shade: Macbeth-Evans Glass Co., Pittsburgh, Pa.
Ironclad storage battery: Elec. Storage Battery Co., Philadelphia, Pa.
Iridite flasher: Betts & Betts Corporation, 258 West 55th st., New York, N. Y.
Ironite wire: Paragon Elec. Co., 5 S. Clinton st., Chicago, Ill.
Isolit insulation: Theo. H. Gary Co., New York.
I-T-E circuit breaker: Cutter Co., Philadelphia, Pa.
Ivory shades: Gleason-Tiebout Glass Co., 71 W. 23d st., New York, N. Y.
I. X. L. tape: Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
I. X. L. wire: Collyer Ins. Wire & Mfg. Co., Pawtucket, R. I.
Jagabi tachoscope: James G. Biddle, 1211 Arch st., Philadelphia, Pa.
Jandus fans and lamps: Adams-Bagnall Elec. Co., Cleveland, Ohio.
Jasco horn: C. J. Alexander Mfg. Co., New York, N. Y.
Jaynes fixture joints: Trumbull Elec. & Mfg. Co., Plainville, Conn.
J. C. P. caplets and molding boxes: James C. Phelps, Springfield, Mass.
J. D. spark plug: Jeffery Dewitt Co., Detroit, Mich.
Jeanesville pump: Internat'l Pump Co., New York, N. Y.
Jefferson cord: J. E. Fricke Co., Philadelphia, Pa.
Jencoco toggle strap: Conlan Elec. Co., New York, N. Y.
Jenks lantern: Thayer & Co., R. L., Chicago, Ill.
Jenney motor: Am. Rotary Valve Co., Anderson, Ind.
Jericho horn: Randall-Faichney Co., Boston, Mass.
Jersey st. fixtures: National Metal Stamping & Mfg. Co., Newark, N. J.
Jesco starter: Jones Elec. Starter Co., Chicago, Ill.
Jewel scrubbing mach.: Finola Mfg. Co., Hannibal, Mo.
Jewel washer: Am. Washer Co., St. Louis.
Jiffy bushing: Fullerton Elec. Co., 109 W. 26th st., New York, N. Y.
J. M. specialties: H. W. Johns-Manville Co., New York, N. Y.
Johns l. v. transformer: J. F. Ashbrook, Chicago.
Johnson clamps: Hickey & Schneider, New York.
Johnston's signal: Union Switch & Signal Co., Swissvale, Pa.
Jo-Jo detachable socket key: Fortas & Jackson Mfg. Co., Memphis, Tenn.
Jomance tape: Johns-Manville Co., N. Y.
Jones desk clamp and wire measuring mch.: John J. Waldman, 136 Liberty st., New York, N. Y.
Jones-Perfection ceiling switch: John J. Waldman, 136 Liberty st., New York.
Jove battery: J. H. Bunnell & Co., 32 Park pl., New York, N. Y.
Jove battery lantern: Merchant Engineers' Corp., New York.
Jove fire alarm: J. H. Bunnell & Co., 32 Park pl., New York, N. Y.
Joy vibrator: Coates Clipper Mfg. Co., Worcester, Mass.
Joyful sad irons: Sun Utilities Co., Moline, Ill.
J. P. Bakelite insulation: H. W. Johns-Manville Co., New York.
Jubilee horn: Randall-Faichney Co., Boston, Mass.
Jumbo insulator: Brookfield Glass Co., 2 Rector st., New York, N. Y.
Jumphlame coil: Auto Coil Co., Jersey City, N. J.
Junior high frequency coil: Edwards Instrument Co., Indianapolis, Ind.
Junior l. v. transformer: Dongan Elec. Mfg. Co., 745 Franklin st., Detroit, Mich., and Jefferson Elec. Mfg. Co., 849 Harrison st., Chicago, Ill., and Thordarson Elec. Mfg. Co., Chicago, Ill.
Jupiter fibre: Wilmington Fibre Specialty Co., Wilmington, Del.
Jupiter fire alarm; J. H. Bunnell & Co., 23 Park pl., New York, N. Y.
Jupiter insulator: George Cutter Co., 411 Notre Dame, South Bend, Ind.
Just Pull socket pull: Premier Novelty Co., Chicago, Ill.
Jypco burner: J. Y. Parke & Co., 29 No. 7th st., Philadelphia, Pa.
Kablak cloth: Mica Insulator Co., 68 Church st., New York, N. Y.
Kachouk tape: Walpole Tire & Rubber Co., Walpole, Mass.
Ka-Ha-Co horn: Kales-Haskel Co., Detroit, Mich.
Kaleidoscope sign: Empire Elec. Sign Co., New York, N. Y.
Kalkeen specialties: Oshkosh Mfg. Co., Oshkosh, Wis.
Kaloid lamp: Laco-Phillips Co., N. Y.
Kappa knife switch: Trumbell Elec. Mfg. Co., Plainville, Conn.
Karaline coloring: Pacific Elec. Co., La Crosse, Wis.
Kazoo motor: Kalamazoo Elec. Motor Co., Kalamazoo, Mich.
K. E. enclosed fuses: Kirkman Engrg. Corp., New York.
Kelsey trolley base: Recording Fare-Register Co., New Haven, Conn.
Kelvin bridge: Leeds & Northrup Co., Philadelphia; Foote, Pierson & Co., New York.
Kennedy clamp: States Co., Park st., cor. New Park ave., Hartford, Ct.
Kenoe fan: Knapp Elec. & Novelty Co., 509 W. 51st st., New York.
Kester solder: Chicago Solder Co., Chicago, Ill.
Keystone exp. bolt: Diamond Expansion Bolt Co., New York, N. Y.
Keystone preservative: Missouri Paint & Varnish Co., St. Louis, Mo.
Keystone gas engine switch: Frank W. Morse, Boston, Mass.
Keystone st. ry. specialties: Elec. Service Supplies Co., Philadelphia, Pa.
Keystone switch: Chelten Elec. Co., Philadelphia, Pa.
Kilarc disc switch: Bowie Switch Co., San Francisco, Cal.
Killark fuse: W. Douglas Woolley Sales Representative Killark Elec. Mfg. Co., 30 N. Michigan ave., Chicago, Ill.
Kilark flasher: Betts & Betts Corporation, 258 W. 55th st., New York.
Kinealy humidifier: Kauffman Htg. & Engineering Co., St. Louis, Mo.
King adjuster: Elec. Specialty Mfg. Co., Pittsburgh, Pa.
King annunciator: Partrick & Wilkins Co., Philadelphia, Pa.
King clothes washer: Rex Mfg. Co., Johnstown, Pa.
King hand phone extension: Elec. Specialty Mfg. Co., Pittsburgh, Pa.

Trade Names

Kingston auto specialties: Kokomo Elec. Co., Kokomo, Ind.

Kinsman desk lights and portable: McLeod, Ward & Co., New York.

Kirby insulator: Wetmore-Savage Co., Boston, Mass.

K. K. wire: Am. Brass Co., Waterbury.

Klaxon horn: Lovell-McConnell Mfg. Co., Newark, N. J.

Kliegl stage ltg. specialties: Universal Elec. Stage Ltg. Co., New York.

Klondike battery: National Carbon Co., Cleveland, O.

Knapp annunciator: Moon Mfg. Co., Chicago, Ill.

Knight fixture hanger: Empire Engineering & Supply Co., New York.

Knockabout flashlight: F. Marcuson, New York, N. Y.

Knostrain grip: F. H. Stewart Elec. Co., 37 N. 7th st., Philadelphia, Pa.

Knowles pumps: Internat'l Steam Pump Co., New York, N. Y.

Knutson trolley pole catcher: Trolley Supply Co., Canton, O.

Knu canopy insulator: A. F. Stanley, New York, N. Y.

Kohlrausch bridge: Foote-Pierson & Co., New York, N. Y.

Komet magneto: Dow Mfg. Co., Braintree, Mass.

Koppat resistor: Railway & Industrial Engrg. Co., Greensburg, Pa.

Krakno shades: Elkins Glass Co., Monaca, Pa.

Kremio storage battery: McCauley Storage Battery Co., Cleveland, O.

Kreuger stage plug: Western Electric Co., New York, N. Y.

Krips-Wright aerial cable hanger: Electrical Appliance Corp., Phila., Pa.

Krupp resistance wire: Thos. Prosser & Son, New York, N. Y.

K. W. rosette. See Rosettes.

Kwik-Lite battery & flashlight: Usona Mfg. Co., 1 Hudson st., New York.

Kwikon conduit fitting: S. R. Fralick & Co., 15 S. Clinton st., Chicago.

Kyanized cross arm pole: Berlin Mills Co., Portland, Me.

Kyle line material: Line Material Co., So. Milwaukee, Wis.

K. & G. boring tool: Geo. Garrison, San Diego, Cal.

K. & W. brushes: J. F. Walsh Co., Pittsfield, Mass.

La Carbonne brush: W. J. Jeandrom, New York, N. Y.

Laclede brush: National Carbon Co., Cleveland, O.

Laco lamp: Laco-Phillips Co., N. Y.

Laidlaw-Dunn-Gordon pumps: Internat'l Steam Pump Co., New York.

Lakin conduit bender: Thomas & Betts Co., 103 Hudson st., New York, N. Y.

Lakin hickey: Thomas & Betts Co., 105 Hudson st., New York, N. Y.

Laminated rail bond: Lord Mfg. Co., Brooklyn, N. Y.

Landee's comealong: Mathias Klein & Sons, Chicago.

Langerfield milk warmer: J. H. White Mfg. Co., 111 N. 3d st., Brooklyn, N. Y.

Langleben brush: Hart & Co., Fostoria, Ohio.

Lassco auto rear lamp: Auto Safety Signal Lamp Co., Philadelphia, Pa.

Laurel soldering paste: Henderson & Shaw, Hyde Park, Mass.

Lavite lava: D. M. Stewart Mfg. Co., Chattanooga, Tenn.

Lawrencecourt third rail insl.: H. W. Johns-Manville Co., New York.

L. R. C. coloring: Lacquer Radiant Co., Philadelphia, Pa.

Lea lamp: Am. Arc Lamp Co., Kalamazoo, Mich.

Leader battery: E. J. Tardie, New York.

Leader tape: Boston Woven Hose & Rubber Co., Dept. No. 50, Cambridge, Mass.

Lee iron ins. pins: H. Thermos & Sons Co., East Liverpool, O.

Leeson coil winding machine: Universal Winding Co., Boston, Mass.

Leich tele.: Am. Elec. Co., Chicago, Ill.

Lenox glass shade: United States Glass Co., Pittsburgh, Pa.

Lenox tele. and swboards.: Samson Elec. Co., Canton, Mass.

Lever toggle bolt: Geo. Cutter Co., 411 Notre Dame, So. Bend, Ind.

Leverite compound: Mitchell-Rand Mfg. Co., 97 John st., New York.

Lorison auto system: Elec'l Repair & Engineering Co., Cleveland, O.

Lewis clothes washer: Grinnell (Ia.) Washing Machine Co.

L. G. circuit breaker: Cutter Co., Philadelphia, Pa.

Liberty bell: Stanley & Patterson, 23 Murray st., New York, N. Y.

Liberty Bell lamp: Hallbauer & Hardman, Schenectady, N. Y.

Liberty vacuum cleaner: Innovation Electric Co., 587 Hudson st., New York.

Light-House Line fixture: Chas. Polacheck & Bro. Co., Milwaukee.

Lightning bug elec. lantern: Stewart-Skinner Co., Worcester, Mass.

Lightning Non-Tubular packing: N. Y. Ins. Wire Co., 114 Liberty st., New York, N. Y.

Lightning spark plug: N. D. Doxey, Elmira, N. Y.

Lightning spark plug: Reflex Ignition Co., Cleveland, O.

Lightning stocks, reamers, etc.: Wiley & Russell, Greenfield, Mass.

Lilliput blasting apparatus: Star Elec. Fuse Wks., Wilkes-Barre, Pa.

Lindstrom plier: Schuchardt & Schutte, New York, N. Y.

Linolac paint and varnish: Mica Ins. Co., 68 Church st., New York.

Linolite portable and fixture: H. W. Johns-Manville Co., New York.

Linotape tape: Mica Insulator Co., 68 Church st., New York.

Little Beauty sad irons: American Elec'l Heater Co., Detroit, Mich.

Little Ben vacuum cleaner: Clements Mfg. Co., Chicago, Ill.

Little Giant hanger: W. T. Norton, West Park, O.

Little Giant exp. bolt: Stannard Mfg. Co., Springfield, Mass.

Little Giant portable tools and conduit bender: Chicago Pneumatic Tool Co., Chicago, Ill.

Little Giant vac. clean.: Pacific Suction Cleaner Co., San Francisco.

Little Giant stocks and dies: Wells Bros. Co., Division Greenfield Tap & Die Corporation, Greenfield, Mass.

Little Hustler fan: Knapp Elec. & Novelty Co., 509 W. 51st st., New York.

Little Rhody flashlight: Providence Elec. Mfg. Co., Providence, R. I.

Lock Fast attachment plug: Yost Elec. Mfg. Co., Toledo, O.

Locke rings and hooks: Cameron Appliance Co., Everett, Mass.

Lohys steel stampings: Edw. E. Cary Co., New York, N. Y.

London guard: McGill Mfg. Co., 39 Oak st., Valparaiso, Ind.

Long horn: H. W. Johns-Manville Co., New York.

Long Life brush: Speer Carbon Co., St. Marys, Pa.

Long Saut clamp: Diamond Expansion Bolt Co., New York, N. Y.

Loomflex flexible conduit: American Circular Loom Co., New York, N. Y.

Loricated conduit: Safety Armorite Conduit Co., Bailey Farrell Bldg., Pittsburgh, Pa.

Lormco tape: Lord Mfg. Co., Brooklyn.

Lowvolt transformer: Campbell Elec. Co., Lynn, Mass.

Loxon guard: McGill Mfg. Co., 39 Oak st., Valparaiso, Ind.

Lucida shade: Haskins Glass Co., Martins Ferry, O.

Lumino inc. lamp: Westinghouse Lamp Co., New York, N. Y.

Luna sign: Haller Consolidated Elec. Sign Co., Chicago.

Luna shade: H. Northwood Co., Wheeling, W. Va.

Lundell motor & fan: Sprague Elec. Wks. of G. E. Co., 527 W. 34th st., New York, N. Y.

Lungen bells and switches: Edwards & Co., New York, N. Y.

Lungmotor: Life Saving Devices Co., New York.

Luxsolite st. fixture: Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

Lyhne portable: Beers Sales Co., N. Y.

Lyon blasting apparatus: Aetna Powder Co., Chicago, Ill.

L. & L. fixture show case: Chas. W. Leveridge, New York, N. Y.

McAdam blue printing: Revolute Machine Co., New York, N. Y.

McAdams trolley wheel: Cleveland Trolley Wheel Co., Cleveland, O.

McBride pole step: Capitol Elec. Co., Salt Lake City, Utah.

McKinley hangers & bushings: Metal Specialties Co., Kansas City, Mo.

McWilliams switchboard: Geo. Cutter Co., 411 Notre Dame st., South Bend, Ind.

Macbeth Illuminometer: Leeds & Northrup Co., Philadelphia, Pa.

MacKae-Blitz spark plug: Randall-Faichney Co., Boston, Mass.

Maconite wire: Bay State Ins. Wire & Cable Co., Hyde Park, Mass.

Madeline fixture: Art Chandelier & Bronze Co., New York.

Magic tape: Boston Woven Hose & Rubber Co., Dept. No. 50, Cambridge, Mass.

Magic vac. cleaner: Innovation Elec. Co., 587 Hudson st., New York.

Magnetite headlight: General Elec. Co., Schenectady, N. Y.

Magneto tape: H. W. Johns-Manville Co., New York, N. Y.

Malton splicing links: McKenney & Waterbury Co., 181 Franklin st., Boston

Malden lamp: Re-New Lamp Co., Boston

Manson tape: Okonite Co., New York.

Marchand cable clamp: Steel City Elec. Co., 1207 Columbus ave., Pittsburgh.

Marbo shade: Phoenix Glass Co., 15 Murray st., New York, N. Y.

Marion torch: Hine-Watt Mfg. Co., Chicago, Ill.

Marlo bell: P. R. Mfg. Co., 621 Bellevue ave., Detroit, Mich.

Marlin cable hangers. See Hangers, Cable.

Mars-Bright battery: Bright Star Battery Co., 430 West 14th st., New York, N.Y.

Mars battery: Bright Star Battery Co., 430 West 14th st., New York, N. Y.

Marsh wire: Standard Underground Cable Co., Pittsburgh, Pa.

Marshall linemen's shield: Linemen Protector Co., Detroit, Mich.

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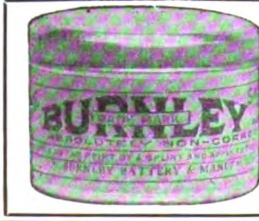

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Trade Names

Martin Rotary Converter: Northwestern Elec. Co. 613 West Adams, Chicago.

Martin st. fixture: National Metal Stamping & Mfg. Co., Newark, N. J.

Martin time switch: Premier Elec. Co., Chicago, Ill.

Marvel toaster: L. B. Lincoln Elec. Wks., 112 W. Adams st., Chicago Ill.

Marvelous heaters & mixers: H. A. Seifke & Co., San Francisco, Cal.

Maschemce tape: Walpole Tire & Rubber Co., Walpole, Mass.

Masco storage battery: Milwaukee Auto Specialty Co., Milwaukee, Wis.

Mascot specialties: J. H. Bunnell & Co., 32 Park pl., New York, N. Y.

Masda battery: F. D. Harper, Everett, Mass.

Master pump: Hartford Machine Screw Co., Hartford, Conn.

Mastic 66 S. Commutator Cement: Alfred Schifton, New York.

Matchless auto wiring & ltg.: Esterline Co., Indianapolis, Ind.

Matchless novelties: Stanley & Patterson, 23 Murray st., New York, N. Y.

Matlock roller: Mathias Klein & Sons, Chicago, Ill.

Matthews photometer: Foote, Pierson & Co., New York, N. Y.

Maxicator maximum demand meter: Fort Wayne Elec. Wks. of G. E. Co., 1612 Broadway, Fort Wayne, Ind.

Maxo auto horns: Garford Mfg. Co., Elyria, O.

Maxolite fixtures: Central Elec. Co., 320 S. 5th ave., Chicago, Ill.

Maxstadt sleeve connector: Chicago Die & Mach. Wks., Chicago, Ill.

Maxum grounding dev.: Fairmount Elec. & Mfg. Co., Philadelphia, Pa.

Maxum tele. mouthpiece: F. R. Weeks Mfg. Co., New York, N. Y.

Mayo arc lamp ins.: National Sewing Mach. Co., Belvidere, Ill.

Maxolite fixtures: Central Elec. Co., Chicago, Ill.

Mazda drawn wire lamps: Edison Lamp Wks. of G. E. Co., Harrison, N. J., and National Quality Lamp Division of G. E. Co., Cleveland, O., and Westinghouse Lamp Co., Bloomfield, N. J.

M. C. paint: Walpole Tire & Rubber Co., Walpole, Mass.

M. D. S. vacuum cleaner: Clayton-Marlborough Mfg. Co., Rochester, N. Y.

Mea magneto: Marburg Bros., N. Y.

Mefco portable: H. C. McFaddin Co., New York, N. Y.

Meggers inst.: James G. Biddle, Boyertown Bldg., Philadelphia, Pa.

Megohmite mica: Meirowsky Bros., 106 Broadway, Jersey City, N. J.

Melilite shade: Gillinder & Sons, Philadelphia, Pa.

Meleady conduit box: Sterling Foundry & Machine Co., Newark, N. J.

Merkle min. lamp: C. D. Wood Elec. Co., 136 Liberty st., New York.

Mermaid hair drier: James Barker, Philadelphia, Pa.

Merspon insulator: Brookfield Glass Co., 2 Rector st., New York, N. Y.

Meruco tape: Mechanical Rubber Co., Cleveland, O.

Mesco specialties: Manhattan Elec. Supply Co., 17 Park pl, New York.

Metallite ltg. fix.: American Dry Ornamental Co., New York.

Meteor elec. lantern: Stewart-Skinner Co., Worcester, Mass.

Meteor flashlight: Narragansett Chemical Co., Providence, R. I.

Metite carbon brush: General Electric Co., Schenectady, N. Y.

Metropolitan hanger: Cameron Appliance Co., Everett, Mass.

Metzger spark plug: H. W. Johns-Manville Co., New York.

M. I. C. compound: Mica Insulator Co., 68 Church st., New York.

Micabeston: American Mica Co., Newton Lower Falls, Mass.

Micabond: Chicago Mica Co., Valparaiso, Ind.

Micanite: Mica Insulator Co., 68 Church st., New York, N. Y.

Micarta insulation: Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

Mico tape: Mica Insulator Co., 68 Church st., New York, N. Y.

Midas sign: Mercantile Adv. Co., N. Y.

Midget G auto ammeter: Eldredge Elec. Mfg. Co., 39 P. O. square, Springfield, Mass.

Midget-guard: V. V. Fittings Co., Philadelphia, Pa.

Midget, Jr., push button: Edwards & Co., New York, N. Y.

Midget shade: Nat'l X-Ray Reflector Co., 233 W. Jackson blvd., Chicago, Ill.

Milanite Perfection unit: Morley Mfg. Co., Boston, Mass.

Miller's stocks and dies: Walworth Mfg. Co., Boston, Mass.

Mills connector: Stackpole Carbon Co., St. Mary's, Pa.

Milton magneto: Webster Mfg. Co., Chicago, Ill.

Milwaukee flashlight: Universal Novelty Co., New York, N. Y.

Mine-A-Phone tele.: Stromberg-Carlson Tele. Mfg. Co., Rochester, N. Y.

Mi-Ra-Lac paint & varnish: Mitchell-Rand Mfg. Co., 97 John st., New York.

Mirrorlite portable and mirror: Holophane Wks. of General Electric Co., Cleveland, O.

Model kickplate: W. H. Nicolay. B'klyn.

Model lamp: Holscher Elec'l Mfg. Co., Warren, O.

Modelfone tele.: S. H. Couch Co., Norfolk Downs, Mass.

Mogul horn: O'Brien Elecrophone Co., Hallowell, Me.

Monarch bell: Manhattan Elec'l Supply Co., 17 Park pl., New York.

Monarch fixture: T. D. Hill & Co., Philadelphia, Pa.

Monarch meter reading lamp: Connelly Iron Sponge & Governor Co., New York.

Monarch selfwinding clock: Walker Bros. & Haviland, Chicago, Ill.

Monarch vacuum cleaner: Guelson & Wathe, Mason City, Ia.

Monitor bell: Manhattan Elec'l Supply Co., 17 Park pl, New York.

Monitor ice cream freezer: Miller & Bro., Philadelphia, Pa.

Monogram sign: Elec. Carriage Call & Specialty Co., New York, N. Y.

Mono-Seal bell: Russell Elec. Co., Danbury, Conn.

Monroe clamp: Hubbard & Co., Pittsburgh, Pa.

Moore clock: Elec. Time & Mfg. Co., West Lafayette, Ind.

Moore tube light: General Elec. Co., Schenectady, N. Y.

Morlite shade: Bournique Glass Co., Kokomo, Ind.

More-Light lt.: Am. El. Co., Chicago.

Morganite brush: Morgan Crucible Co., 112 Liberty st., New York, N. Y.

Morse tree insulator: Elec. Appraisal & Inspection Co., Cleveland, O.

Mosher headlight: Dayton Mfg. Co., Dayton, O.

Motograph sign: Federal Sign System (Electric), Lake & Desplaines sts., Chicago, Ill.

Motorlac paint: Sterling Varnish Co., Pittsburgh, Pa.

Mrs. Potts sad irons: Elec. Mfg. Co., San Francisco, Cal.

Multibestos tape: Standard Woven Fabric Co., Framingham, Mass.

Multilet box & fitting: Sprague Elec. Wks. of G. E. Co., 527 W. 34th st., New York, N. Y.

Multi-Call signal: National Scale Co., Chicopee Falls, Mass.

Multico tape: Standard Woven Fabric Co., Framingham Mass.

Multiflex lamp: Simplex Photo Products Co., Morris Park, L. I.

Multiple Unit furnaces: Elec. Htg. Apparatus Co., New York.

Multifone tele.: S. H. Couch Co., Norfolk Downs, Mass.

Multipo socket: H. T. Paiste Co., Philadelphia, Pa.

Multiuse bags & belts: Mathias Klein & Sons, Chicago, Ill.

Multi-Vapo-Gap arrester: Lord Mfg. Co., Brooklyn, N. Y.

Muncie Type insulator: Hemingray Glass Co., New York, N. Y.

Murray st. fixture: National Metal Stamping & Mfg. Co., Newark, N. J.

Myers instrument: Conduit Elec. Co., Syracuse, N. Y.

Nagrite tape: H. W. Johns-Manville Co.

National disc fan: Howard & Morse, New York, N. Y.

National guard: McGill Mfg. Co., 39 Oak st., Valparaiso, Ind.

National paring machine: Reinhold Mfg. Co., Detroit, Mich.

National signal: Sandwich (Ill.) Elec. Co.

National signal: Union Switch & Signal Co., Swissvale, Pa.

National snap switch: Standard Elec. Mfg. Co., Chicago, Ill.

National storage bat.: U. S. Lt. & Htg. Co., Niagara Falls, N. Y.

National toll box: Am. Elec. Co., Chicago, Ill.

National trolley base: Trolley Supply Co., Canton, O.

National trolley guard: Ohio Brass Co., Mansfield, O.

National vac. cleaner: Hugro Mfg. Co., Warsaw, Ind.

Navalite conduit: Mark Mfg. Co., Chicago, Ill.

N. B. sign: Elec. Carriage Call & Specialty Co., New York, N. Y.

N. B. S. Coil: Leeds & Northrup Co., Philadelphia, Pa.

N. C. fuses, clamps, wire, etc.: Schutz Mfg. Co., Chicago, Ill.

N. D. Co. solder, iron: Apex Elec. Mfg. Co., Chicago, Ill.

Nebulite shade: Gillinder & Sons, Philadelphia, Pa.

Neco wire gauge: Novelty Elec. Co., Philadelphia, Pa.

Nelson X-Ray outfit: Meyer Co., Wm., Chicago, Ill.

Nelson static machine: Meyer Co., Wm., Chicago, Ill.

Nemalite shade: Gillinder & Sons, Philadelphia, Pa.

Neponset paper: Walpole Tire & Rubber Co., Walpole, Mass.

Neptune wire: Atlantic Ins. Wire & Cable Co., 120 Liberty st., New York, N. Y.

Nernst glower lamp: Pittsburgh Elec. Specialty Co., Pittsburgh, Pa.

Nestle hair waver: E. Burnham, Chicago.

Neu tank alarm: W. R. Ostrander & Co. 22 Dey st., New York, N. Y.

Neuraberg carbon: Hugo Reisinger, N. Y

Never Break guard: Frank W. Morse, Boston, Mass.

Trade Names

Never Slip come along. Union Elec. Mfg. Co., Pekin, Ill.
Neverout auto lamp: Rose Mfg. Co., Philadelphia, Pa.
Neverturn climber: Smith & Hemenway Co., New York, N. Y.
New Century trouble finder: Century Elec'l Co., Syracuse, N. Y.
New Century battery: National Carbon Co., Cleveland, O.
Newcode receptacle: Stanley & Patterson, 23 Murray st., New York.
Never Creep guy anchor: Chance Mfg. Co., Centralia, Mo.
Nevernick dish washer: Domestic Utilities Co., Newark, N. J.
New Departure fan: Lionel Mfg. Co., 48 East 21st, New York, N. Y.
New Idea fixture: Commercial Elec'l Supply Co., St. Louis, Mo.
New Idea sold compound: Wm. J. Harwig Co., Detroit, Mich.
New Life vibrator: Hamilton-Beach Mfg. Co., Racine, Wis.
New Mite push button: Edwards & Co., New York.
New Standard dry battery: Wm. Roche Elec'l Co., New York, N. Y.
Newtone auto horn: Automobile Supply Mfg. Co., Brooklyn, N. Y.
New Wrinkle socket: Bryant Elec. Co., Bridgeport, Conn.
N. Y. clamp: Cameron Appliance Co., Everett, Mass.
Niagara compound: G. W. Fowler & Co., No. Tonawanda, N. Y.
Nichols serving table: Bennington Scale Co., Bennington, Vt.
Nichrome resistance wire: Driver-Harris Wire Co., Harrison, N. J.
Nico compound: National Insulator Co., Boston, Mass.
Nico shellac paint: Mica Insulator Co., 68 Church st., New York.
Nikonow Insulator: Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
1900 battery: Nungesser Carbon & Battery Co., Cleveland, O.
Nitelite flashlight: Providence Elec. Mfg. Co., Providence, R. I.
Nite-Lite transformer socket: Mohawk Elec. Mfg. Co., Newark, N. J.
Ni-Tro-Lite ltg. fixtures: Risinger Mfg. Co., East Liverpool, O.
Nitrolite ltg. fixtures: Harter Mfg. Co., Chicago, Ill.
Noark fuse & boxes: H. W. Johns-Manville Co., New York, N. Y.
Nocare radiator: Elec'l Steam Radiator Co., Portland, Me.
Nodaz auto dimmer: Ward-Leonard Elec. Co., Bronxville, N. Y.
Nokorode soldering comp.: M. W. Dunton Co., Providence, R. I.
Non-Breakable messenger hanger: National Tele. Supply Co., Cleveland, O.
Nonpareil bell: Manhattan Elec'l Supply Co., 17 Park pl., New York.
Norbitt socket & reecptacle: Crouse-Hinds Co., Syracuse, N. Y.
Norcross soldering comp.: J. F. Walsh Co., Pittsfield, Mass.
Norden socket: E. H. Freeman Elec. Co., Trenton, N. J.
Nordyke hanger: Standard Underground Cable Co., Pittsburgh, Pa.
Norfolk tape: Walpole Tire & Rubber Co., Walpole, Mass.
Norfolk vac. cleaner: Richmond Radiator Co., New York.
Northall lamp: Am. Arc Lamp Co., Kalamazoo, Mich.
North telephones: Tele. Improvement Co., Chicago, Ill.
Northern motor: Ft. Wayne Elec. Wks., 1612 Broadway, Ft. Wayne, Ind.
No Spark commutator comp.: Colebaugh-Block Self Lubricating Carbon Co., 510 Bulletin bldg., Philadelphia, Pa.
Nosplice wire connector: Sharfink Elec. Mfg. Corp., New York.
No Thread conduit fitting: Appleton Elec. Co., 212 N. Jefferson, Chicago, Ill.
Novalux st. fixture: Edison Lamp Wks. of General Electric Co., Harrison, N. J.
Novi lamp: Franklin Elec. Mfg. Co., Hartford, Conn.
Novo Bronze fixture: Art Chandelier & Bronze Co., New York.
Nuart shade: Imperial Glass Co., Bellaire, O.
Nubolux shade: Lensed Elec. Shade Co., New York, N. Y.
Nu air heater: Phelps Mfg. Co., Detroit, Mich.
Nue dry battery: Union Battery Co., Belleville, N. J.
N-W line material: Northwestern Construction Co., New York.
N-W renewable fuses: Columbia Mach. Wks. & Mall. Iron Co., B'klyn.
N-X circuit breaker: Cutter Co., Philadelphia, Pa.
Nylander elec. saline heater: Pacific Surgical Appliance Co., Seattle, Wash.
Oakes boring tool: P. R. Mfg. Co., 621 Bellevue ave., Detroit, Mich.
Oakwood soldering comp.: Weaver Specialty Co., Pittsburgh, Pa.
Oamco specialties: Overbagh & Ayres Mfg. Co., Chicago.
O. B. compound: Standard Varnish Wks., New York, N. Y.
Obermiller clocks: Betts & Betts Corporation, 258 W. 55th st., New York
O'Brien insulator: Brookfield Glass Co., 2 Rector st., New York, N. Y.
O'Brien Lamp: Straight Filament Lamp Co., New York, N. Y.
O. C. Little's compound: Onward Mfg. Co., Menasha, Wis.
Ohio vac. clean.: Wise-Harrold Elec. Co., New Philadelphia, O.
Oildag-graphite: Int'n'l Acheson Graphite Co., Niagara Falls, N. Y.
O. K. anchor: St. Louis Malleable Casting Co., 7777 N. Conduit ave., St. Louis, Mo.
O. K. boring tool: Elec. Appliance Co., Chicago, Ill.
O. K. clothes washer: H. F. Brammer Mfg. Co., Davenport, Ia.
O. K. clamp: Hart Mfg. Co., Hartford, Conn.
O. K. bolt: Isaac Church, So. Norwalk, Conn.
O. K. sleet cutter: Matthews & Bro., W. N., 3705 Forest Park blvd., St. Louis, Mo.
O. K. wire: Phillips Ins. Wire Co., Pawtucket, R. I.
Old Reliable torch: Turner Brass Wks., Sycamore, Ill.
Old Sol pencil flashlight: Hawthorne Mfg. Co., 9 Spruce st., Bridgeport, Conn.
Olympic auto horn: Elec. Spark Appliance Co., Brooklyn, N. Y.
Omlac paint: Emil Calman & Co., New York, N. Y.
Oneida horn: Elec. Horn & Specialty Co., Utica, N. Y.
Oneida chain: Am. Chain Co., Bridgeport, Conn.
O'Neill ring hook hanger reinforced pin & bracket: Pettingell-Andrews Co., Atlantic ave., Pearl & Purchase sts., Boston, Mass.
Opalite shade: H. G. McFaddin & Co., New York.
Operaphone hearing dev.: Stolz Electrophone Co., Chicago, Ill.
Oplex-Sign signs: Flextume Sign Co., Buffalo, N. Y.
Optimus-plating dynamo: Munning-Lobe Co., Matawan, N. J.
Oregon rail bond: Lord Mfg. Co., Brooklyn, N. Y.
Orgoblo organ blower: Organ Power Co., Hartford, Conn.
Orr reinforced wooden pole: Pittsburgh Reinforced Pole Co., Pittsburgh, Pa.
Ortholite photographic light: Benjamin Elec. Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Osborn automobile chair: Electriquette Mfg. Co., Los Angeles, Cal.
Oscillator clothes washer: Domestic Equipment Co., Chicago, Ill.
Osmaco lacquer: Oscar Schlegel Mfg. Co., New York.
Ottowald potentiometer: Leeds & Northrup Co., Philadelphia, Pa.
Ovalduct conduit bushing: Steel City Elec. Co., Pittsburgh, Pa.
Owners coil: Auto Coil Co., Jersey City.
Oxyoline med. apparatus: Neel-Armstrong Co., Akron, O.
Ozite compound: Standard Underground Cable Co., Pittsburgh, Pa.
Ozokorite compound: E. T. Trotter & Co., 588 Johnson ave., Brooklyn, N. Y.
Packard vacuum pumps: Norman Hubbard's Sons, Brooklyn, N. Y.
Pagrip metal moulding fitting: Appleton Elec. Co., 212 N. Jefferson st., Chicago, Ill.
Pallette wire gauge: Novelty Elec. Co., Philadelphia, Pa.
Palmer limit switch: Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Panchroma photo lamp: Allison & Hadaway, New York.
Panchros photo engraving lamp: N. Y. Engravers' Supply Co., New York.
Panelettes panelboards: H. T. Paiste Co., Philadelphia, Pa.
Panelex shade: Holophane Wks. of G. E. Co., Cleveland, O.
Panther spark plug: H. C. Faust Co., Philadelphia, Pa.
Parac wire: Phillips Insulated Wire Co., Pawtucket, R. I.
Paradox arrester: Gifford Elec. Mfg. Co., Traverse City, Mich.
Paragon knife switch: Geo. Cutter Co., 411 Notre Dame st., South Bend, Ind.
Paragon shade: Amer. Reflector & Ltg. Co., Chicago, Ill.
Paragon tape: General Elec. Co., Schenectady, N. Y.
Parallax photo engraving lamp: R. D. Gray, Ridgewood, N. J.
Parallel comealong: Eureka Co., North East, Pa.
Para-Steel reflector: Wheeler Reflector Co., Boston, Mass.
Paranite wire: Indiana Rubber & Ins. Wire Co., Jonesboro, Ind.
Parian shade: Gill Bros. Co., 225 Parian Bldg., Steubenville, O.
Paroxel wire: Bishop Gutta Percha Co., New York, N. Y.
Partridge brush: National Carbon Co., Cleveland, O.
Partz battery: S. S. White Dental Mfg. Co., Philadelphia, Pa.
Passmour socket: Pass & Seymour, Solvay, N. Y.
Pastelle glass shade: Consolidated Lamp & Glass Co., Corapolis, Pa.
Pathfinder flashlight: Electrocraft Co., Philadelphia, Pa.
Patterson battery holder set floor box and tank alarm: Stanley & Patterson, 23 Murray st., New York, N. Y.

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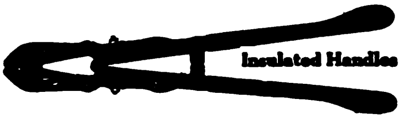

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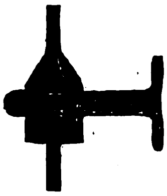

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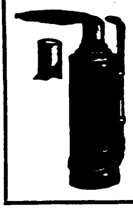

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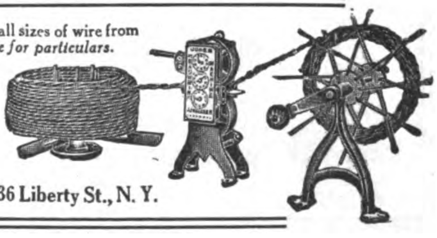

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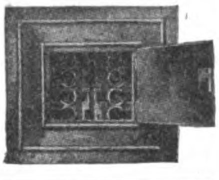

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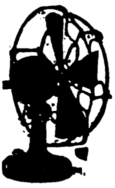

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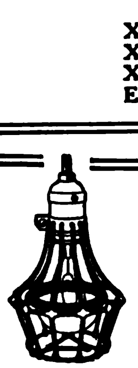

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Paul house pump: Ft. Wayne Engraving & Mfg. Co., Ft. Wayne, Ind.
Paul ltg. plant: Fort Wayne (Ind.) Engineering & Mfg. Co.
Peerless bell: Manhattan Elec'l Supply Co., 17 Park pl., New York.
Peerless blue printing: C. F. Pease Co., Chicago, Ill.
Peerless cleaner & ltg. plant: United Mfg. Co., Kansas City, Mo.
Peerless Fonarm bracket: Am. Steel Wks. Co., Boston, Mass.
Peerless ignition outfit: Tritt Elec. Co., Union City, Ind.
Peerless ltg. plant: Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Peerless meat chopper: Stimpson Scale & Mfg. Co., Northville, Mich.
Peerless meter seal: United Seal Co., Columbus, O.
Peerless ins. paper: National Fibre & Insulation Co., Yorklyn, Del.
Peerless portable tool: Cincinnati Tool Co., Cincinnati, O.
Peerless instruments: Thompson-Levering Co., Philadelphia, Pa.
Peerless signs: Novelty Sign Co., Cincinnati, O.
Peerless spark plug: Toledo Spark Plug Mfg. Co., Toledo, O.
Peerless transformer: Enterprise Elec. Co., Warren, O.
Peerless tree insulator: S. Marlatt, Richmond, Ind.
Peerless trolley specialties: Trolley Supply Co., Canton, O.
Peerless wire: Indiana Rubber & Ins. Wire Co., Jonesboro, Ind.
Peirce cable hanger: National Tele. Supply Co., Cleveland, O.
Peirce connectors, bolts, braces and brackets: Hubbard & Co., Pittsburgh, Pa.
Peirce hammer drill: Hubbard & Co., Pittsburgh, Pa.
Pen-Electro-Lite flashlight: Standard Elec. Novelty Co., 10 N. Desplaines st., Chicago, Ill.
Pomco lamp: Phila. Elec'l Mfg. Co., Philadelphia, Pa.
Peoria clothes washer: Haag Bros. Co., Peoria, Ill.
Perfect exp. bolt: Church, Isaac, South Norwalk, Conn.
Perfection auto terminal: Fitzgerald Mfg. Co., Providence, R. I.
Perfection brushes. See Brushes, Commutator.
Perfection charging outfit: Marko Storage Battery Co., Brooklyn, N. Y.
Perfection connector: Fitzgerald Mfg. Co., Torrington, Conn.
Perfection shade holder: Manhattan Brass Co., New York, N. Y.
Perfection tape: Mechanical Rubber Co., Cleveland, O.
Perfecto compound: Warren Lubricant Co., Buffalo, N. Y.
Perfector connector: Simplex Auto Specialty Co., Detroit, Mich.
Perfex specialties: Samson Elec. Co., Canton, Mass.
Perkins switchboards: Bryant Elec. Co., Bridgeport, Conn.
Perma-color coloring: C. E. Franche & Co., 440 Orleans st., Chicago, Ill.
Perma-Effect clamp: H. T. Paiste Co., Philadelphia, Pa.
Perry wire scraper: Dicke Tool Co., Downers Grove, Ill.
Persian shade: Gillinder & Sons, Philadelphia, Pa.
Pheno shade: Phoenix Glass Co., 15 Murray st., New York.
Phenoleum paint and wood preservative: Dielectric Mfg. Co., St. Louis, Mo.
Philbrick mast arm: Lundin Elec. & Mach. Co., Boston, Mass.
Phillips exp. bolts: Garrison Brass & Machine Wks., New York.
Phillips spring hammer: Daugherty-Smith-Phillips Co., Chicago, Ill.
Phoenix flasher: M. C. Ryan Co., Phoenix, N. Y.
Phoenix wire: Electrical Alloy Co., Morristown, N. J.
Phone Electric wire: Bridgeport Brass Co., Bridgeport, Conn.
Phone-eze bracket: Seely Office Appliance Co., New York, N. Y.
Pianotite portable: Franks Mfg. Co., Rock Island, Ill.
Pilabrasgo reflector: Pittsburgh Lamp, Brass & Glass Co., Pittsburgh, Pa.
Pillowetts htg. pad: Jupiter Elec. Products Co., Cleveland, O.
Pipe taplets: H. T. Paiste Co., Philadelphia, Pa.
Pittsburgh conduit: Enameled Metals Co., Pittsburgh, Pa.
Pittsburgh washer and wringer: Pittsburgh Gage & Supply Co., Pittsburgh, Pa.
Pittsfield ignition specialties: Western Electric Co., New York.
Pix water heater: Albert Pick & Co., Chicago, Ill.
P. K. taplets and rosettes: H. T. Paiste Co., Phila., Pa.
Planchon filament: Fahn & McJunken, New York, N. Y.
Plania carbon: H. M. Hirschberg Co., New York, N. Y.
Playtone lacquer: Pacific Elec. Co., La Crosse, Wis.
Plumwood shade holder: Plume & Atwood Mfg. Co., Waterbury, Conn.
Poke Bonnet shade: Nat'l X-Ray Reflector Co., 233 W. Jackson blvd., Chicago, Ill.
Polycase shade: Gleason-Tiebout Glass Co., 71 W. 23d st., New York, N. Y.
Poney rosette: Manhattan Elec'l Supply Co., 17 Park pl., New York.
Poney rosette: H. T. Paiste Co., Philadelphia, Pa.
Porcupine auto generator: Carleton Co., 174 Summer st., Boston, Mass.
Porox storage bat.: Albert Muller, Jamaica, L. I.
Positive ex-bolt: A. C. Seaman, Phila.
Potentiostat transformer: U. S. E. M. Co., 221 W. 23rd st., New York.
Power dry battery: Union Battery Co., Belleville, N. J.
Pract-El-Lite bicycle lamp and flashlight: Central Telephone & Elec. Co., 310 N. 11th st., St. Louis, Mo.
Precision boring tool: Russell Jenning Mfg. Co., Chester, Conn.
Prefex burner: Samson Elec. Co., Canton, Mass.
Premier annunciator: Stanley & Patterson, 23 Murray st., New York.
Premier bell: Manhattan Elec'l Supply Co., 17 Park pl., New York, N. Y.
Premier vibrator: Manhattan Elec'l Supply Co., 17 Park pl., New York.
Premier Sleeve: Bryant Zinc Co., Chicago, Ill.
Prescott pumps: Internt'l Steam Pump Co., New York.
Preservatine C. C.: Milwaukee Wood Preserving Co., Milwaukee.
Presteel Poles: Hubbard & Co., Pittsburgh, Pa.
Presto annunciator: Partrick & Wilkins Co., Philadelphia, Pa.
Presto soldering compound: L. B. Allen Co., 4550 No. Lincoln st., Chicago, Ill.
Presto flashlight trouble, bicycle lamp and cigar lighter: Metal Cpecialties Mfg. Co., 748 W. Monroe st., Chicago, Ill.
Presturn sockets and receptacles: Harvey Hubbell, Bridgeport, Conn.
Priest horse clipper: Am. Shearer Mfg. Co., Nashua, N. H.
Prima shade: C. D. Wood Elec. Co., 136 Liberty st., New York, N. Y.
Primo tele.: Central Tele. & Elec. Co., 310 N. 11th st., St. Louis, Mo.
Princess sad iron: Chicago Flexible Shaft Co., Chicago, Ill.
Princess sockets & receptacles: Electrical Mfg. Co., Denver, Colo.
Prisections clamps: W. N. Matthews & Bro., 3705 Forest Park blvd., St. Louis.
Productograph office indicator: Slocum, Avram & Slocum, New York.
Projectoscope flasher: Kelley & Kelley, Jersey City, N. J.
Protected rail bond: Elec. Service Supplies Co., Philadelphia, Pa.
Protector guard: McGill Mfg. Co., 39 Oak st., Valparaiso, Ind.
Provo Type insulator: Hemingray Glass Co., Covington, Ky.
Prunax tree trimmer: Mathias Klein & Sons, Chicago, Ill.
Psyche shade: Haskins Glass Co., Martins Ferry, O.
Pull Up blasting app.: Dupont De Nemours Powder Co., E. I., Wilmington.
Pullrite auto switch: Frank W. Morse, Boston, Mass.
Pulmotor respirators: Draeger Oxygen Apparatus Co., Pittsburgh, Pa.
Puritan switches: S. H. Couch Co., Norfolk Downs, Mass.
Puritan paper & cloth: American Mica Co., Newton Lower Falls, Mass.
Push Down blasting apparatus: Star Elec. Fuse Wks., Wilkes-Barre, Pa.
Pushrite bush button: S. B. Couch Co., Norfolk Downs, Mass.
Push Up crow foot: Cleveland Elec. Fittings Co., 912 Society for Savings Bldg., Cleveland, O.
Pyro shade: Holophane Wks. of G. E. Co., Cleveland, O.
Pyrotite plug: Bryant Elec. Co., Bridgeport, Conn.
P. & A. Plier: Plume & Atwood Mfg. Co., Waterbury, Conn.
P. & B. paint & varnish: Standard Paint Co., Woolworth Bldg., New York.
P. & G. wire scraper: Elec. Tool Co., Chicago, Ill.
P. & T. electric lock: Warren E. Clark, Dorchester, Mass.
Q. A. magnet wire: Standard Underground Cable Co., Pittsburgh, Pa.
Queen lamp coloring: Brunner Chemical Wks., Cincinnati, O.
Queen washer: J. H. Knoll, Reading, Pa.
Queene sold. comp.: Brunner Chemical Wks., Cincinnati, O.
Quick Action ignition spec.: Knoblock-Heideman Mfg. Co., So. Bend, Ind.
Quick connector: Knoblock-Heideman Mfg. Co., South Bend, Ind.
Quickstrip cable: Pratt Church Co., Frankford, N. Y.
Quixet floor box: Geo. Cutter Co., 411 Notre Dame, South Bend, Ind.
Q. & S. cord adjuster: Am. Vulcanized Fibre Co., Wilmington, Del.
Radial Wave st. fixture: Harvey Hubbell, Bridgeport, Conn.
Radiant grid.: General Elec. Co., Schenectady, N. Y.
Radio tele. bracket: American Elec. Co., Chicago, Ill.
Radion lamp: H. C. White Co., No. Bennington, Vt.

Trade Names

Radium storage bat.: Milwaukee Auto Specialty Co., Milwaukee, Wis.
Ralco plugs and receptacles: Central Elec. Co., Chicago.
Rapid Fire drill: Diamond Expansion Bolt Co., New York, N. Y.
Rapid Fire horn: Russell Elec. Co., Danbury, Conn.
Raven enamd wire: Automatic Elec. Co., Chicago, Ill.
Raven rubber covered wire: New York Ins. Wire Co., 114 Liberty st., New York, N. Y.
Ray desk light: Skelley Bracket Co., Cleveland, O.
Ray-Do shades: Elkins Glass Co., Monaca, Pa.
Rayline portables & fixtures: Straight Filament Lamp Co., New York.
Raymur res. wire: Murray Wire Co., Newark, N. J.
Read-Easy desk light: Am. Elec. Co., Chicago, Ill.
Readyspark battery: U. S. Auto Battery Co., New York.
Readytouse box: James F. Burns, Philadelphia, Pa.
R. E. A. L. monitor bell: Edwards & Co., New York, N. Y.
Real wire reels: Wiring Equipt. Co., Philadelphia, Pa.
Realflex cable conduit: Western Conduit Co., Youngstown, O.
Reco sign specialties: Reynolds Elec. Co., 422 S. Talman ave., Chicago, Ill.
Recti bell: Edwards & Co., New York.
Red clothes washer: Hurley Machine Co., 37 S. Clinton st., Chicago, Ill.
Red Cross compound: Hart & Co., Fostoria, O.
Red Devil tool: Smith & Hemenway Co., New York.
Red Head spark plug: Emile Grossman Co., Brooklyn.
Red Hot torch: Ashton Mfg. Co., Newark, N. J.
Red Label spring wire: Hammacher, Schlemmer & Co., New York.
Red Ring vac. cleaner: National Stamping & Elec. Wks., Chicago.
Red Seal battery: Manhattan Elec'l Supply Co., 17 Park pl., New York.
Red Star battery: White Star Battery Co., New York.
Red Top anchor: Universal Cable Grip Co., Syracuse, N. Y.
Red Top battery: National Carbon Co., Cleveland, O.
Redina soldering comp.: Reade Mfg. Co., Hoboken, N. J.
Redsealite flashlight: Manhattan Elec'l Supply Co., 17 Park pl., New York.
Resco Pump: Rider-Ericsson Engine Co., New York.
Reed's incubator: United Elec. Sales Co., New Orleans, La.
Ree-Fil-Bell fuses & plugs: Barbaro Elec'l Mfg. Co., Belleville, Ill.
Reflectolier shade: Harter Mfg. Co., Chicago, Ill.
Reflectolyte fix.: Frank Adam Elec. Co., St. Louis, Mo.
Reflector & Hdw. Specialty Mfg. Co., Chicago.
Reflectric signal: Western Display Co., St. Paul, Minn.
Reflex sign: A. & W. Elec. Sign Co., Cleveland, O.
Refrastite compound: Dielectric Mfg. Co., St. Louis, Mo.
Regent lamp: N. Y. Elec. Lamp Co., New York.
Reichsanstalt photometers: Leeds & Northrup Co., Philadelphia, Pa.
Reidler pump: Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Rela Lamp Adjuster: Adolph Cohn, West Hoboken, N. J.
Reliable floor tread: Manhattan Elec'l Supply Co., 17 Park pl., New York.
Reliable time switch: Central Burglar Alarm Co., Chicago, Ill.
Reliable vacuum cleaner: Clements Mfg. Co., Chicago, Ill.
Reliance bell: Francis Keil & Son, New York, N. Y..
Reliance hydrometer: Storage Battery Supply Co., New York.
Reliance Jr. opener & lock: Francis Keil & Sons, New York, N. Y.
Reliance lamp: Holscher Elec'l Mfg. Co., Warren, O.
Reliance rheostat: Reno-Kaetker Elec. Co., Cincinnati, O.
Reliance spark plug: Jeffery Dewitt Co., Detroit, Mich.
Reliance vibrator: Manhattan Elec'l Supply Co., 17 Park pl., New York.
Reliance wire: Am. Steel & Wire Co., Chicago.
Remek transformer: Crocker-Wheeler Co., Ampere, N. J.
Remico mica: Republic Mica Co., Inc., 46 West Broadway, New York.
Repello auto horn: Premier Electric Co., Chicago, Ill.
Resistal glove: Morrison-Riker Mfg. Co., Grinnell, Ia.
Re Viv O storage battery: Storage Battery Co. of Am., Chicago.
Rex boxes and specialties: Wm. H. Colgan Co., West Newton, Mass.
Rex bell: P. R. Mfg. Co., 621 Bellevue ave., Detroit, Mich.
Rex conduit bender: M. B. Austin & Co., 700 Jackson blvd., Chicago, Ill.
Rex hanger: Eureka Supply Co., Sewell, N. J.
Rex headlight: Dayton (O.) Mfg. Co.
Rex paint and varnish: Flintkote Mfg. Co., New York, N. Y.
Rex vibrator: P. A. Geier Co., Cleveland, O.
Rexo horn: Garford Mfg. Co., Elyria, O.
Rhoades unit spark system: New York Coil Co., New York, N. Y.
Richard recording pyrometer: E. Du Vivier, New York, N. Y.
Riot motor driven bell: Edwards & Co., New York.
Ritetite connector: Nat'l Elec. Specialty Co., Toledo, O.
Rival annunciator: Samson Elec. Co., Canton, Mass.
Riverside lamp post: Cutter Co., Geo., 411 Notre Dame, So. Bend, Ind.
R. I. W. paint: Toch Bros., New York.
R-L adjuster: Runzel-Lenz Elec. Mfg. Co., Chicago, Ill.
Robert W. Paul imp. inst.: C. J. Brown, New York, N. Y.
Roberts boring tool: Jos. McCrea & Co., Chicago, Ill.
Roberts linemen's climber: Oshkosh Mfg. Co., Oshkosh, Wis.
Roberts polarity changers: Elec. Specialty Co., Cedar Rapids, Ia.
Rochester box: Ricker Mfg. Co., Rochester, N. Y.
Rock Island battery: Manhattan Elec. Supply Co., 17 Park pl., New York
Roco wire measuring mach.: Root Co., Bristol, Conn.
Roffy auto system: Pittsburgh Elec. Specialties Co., Pittsburgh, Pa.
Rollinson specialties: Mohawk Elec. Mfg. Co., Newark, N. J.
Romeo clamp: Rochester Elec. Motor Co., Rochester, N. Y.
Romeoid wire: Rome (N. Y.) Wire Co.
Rosco auto specialties: A. W. Rosen & Co., 610 Broadway, New York.
Rose x-ray outfit: Empire Elec. Co., Los Angeles, Cal.
Rosedore glass shade: Consolidated Lamp & Glass Co., Corapolis, Pa.
Ross annunciator: Samson Elec. Co., Canton, Mass.
Rotokoll tele. & swboards.: Samson Elec. Co., Canton, Mass.
Royal clothes washer: Haag Bros. Co., Peoria, Ill.
Royal htg. dev.: Rochester Stamping Co., Rochester, N. Y.
Royal Megohmite mica: Melrowsky Bros., 106 Broadway, Jersey City, N. J.
Royal vac. clean. vibrator and drier: P. A. Geier Co., Cleveland, O.
Roxite insulation: Northern Industrial Chemical Co., Boston, Mass.
Rub-board clothes washer: John Dietz Mfg. Co., Cincinnati, O.
Rubes horn: Auto Supply Mfg. Co., Brooklyn, N. Y.
Ruby Core wire: Safety Ins. Wire & Cable Co., Pittsburgh, Pa.
Ruff & Tuff stocks and dies: Walworth Mfg. Co., Boston, Mass.
Ruralite lighting plants: Gray Elec. Co., Springfield, O.
Russell-Hummer horn: Russell Elec. Co., Danbury, Conn.
Russell socket & receptacle: E. H. Freeman Elec. Co., Trenton, N. J.
R. & S. attachment plug: Rice Elec. Co., Chicago.
Safeguard auto horn: Duplex Elec. Mfg. Co., Pittsburgh, Pa.
Safetube conduit: Saylor Elec. & Mfg. Co., Pittsburgh, Pa.
Safety First fire extinguisher: Electric Operations Co., Bush Terminal, Brooklyn, N. Y.
Safety guy anchor: Miller Anchor Co., Norwalk, O.
Safety meter seal: United Seal Co., Columbus, O.
Safety racks & rings: Nuhring & Bros., Cincinnati, O.
Safety portable guard: McGill Mfg. Co., Valparaiso, Ind.
Salite ltg. fixture: Shapiro & Aronson, New York.
Salamander wire asbestos: Independent Lamp & Wire Co., New York.
Sample l. v. transformer: Campbell Elec. Co., Lynn, Mass.
Samson tele.: Am. Elec. Co., Chicago.
Samson horn: Am. Elec. Co., Chicago.
Samson comealong: Mathias Klein & Sons, Chicago.
Samson insulator and splicer: Drew Elec. & Mfg. Co., Indianapolis, Ind.
Samson turbine: James Leffel & Co., 336 Lagonda st., Springfield, O.
Sanderson commutator: Warren Lubricant Co., Buffalo, N. Y.
Sani-Copper clothes washer: Wenzelman Mfg. Co., Galesburg Ill.
Sarco comp.: Standard Asphalt & Rubber Co., Chicago.
Savr cookers: Good Housekeeping Cooker Co., Berkeley, Cal.
Saxon auto horn: Russell Elec. Co., Danbury, Conn.
S. B. resistance wire: Driver-Harris Wire Co., Harrison, N. J.
Schoenmehl battery: Waterbury Battery Co., Waterbury, Conn.
Schulz lathe: Wilcor Mfg. Co., 4824 W. Lake st., Chicago.
Schureman rheostat: Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Schwartz elec. comb.: Wm. F. Slaughter Co., Chicago, Ill.

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Schweitzer brush: Chemelectric Co., Chicago, Ill.

Schweitzer detector, synchroscope & indicator: Chemelectric Co., Chicago, Ill.

Scicluna arc lamp clutch: Manchester Sales Co., Buffalo, N. Y.

Scoop shade: Nat'l X-Ray Reflector Co., 233 W. Jackson blvd., Chicago.

Search light desk light: McCrosky Reamer Co., Meadville, Pa.

Sebco expansion bolts & rings: Star Expansion Bolt Co., New York.

Secret Service battery: F. D. Harper, Everett, Mass.

Security cabinet: F. Bissell Co., 226 Huron .st., Toledo.

Security pole line specialties: F. Bissell Co., Toledo, O.

Security sockets and receptacles: E. H. Freeman Elec. Co., Trenton, N. J.

Securo connector: Stevens & Co., New York.

Seeco-Balto dumbwaiters: Standard Elec. & Elevator Co., Baltimore, Md.

Segur coil winder and spreader: Elec'l Mfg. Equipment Co., Chicago, Ill.

Selco alarm bell: Spies Elec. Wks., Chicago, Ill.

Semaphore annunciator: Edwards & Co., New York, N. Y.

Service motor & ltg. sets: Rochester Motors Co., Rochester, N. Y.

Service tape: Boston Woven Hose & Rubber Co., Dept. No. 30, Cambridge, Mass.

Servu Htg. devices: Konsrv Elec. Co., Cleveland, O.

Shad-o-less fixtures: Harter Mfg. Co., Chicago, Ill.

Shamrock clamps, boxes, alarms and tank switches: W. F. Irish Elec. Co., New York.

Sharp-Miller photometer: Foote Pierson & Co., New York.

Shatter-lock shade-holder: John Cruikshank, Shamokin, Pa.

Shawmut specialties: Condit Elec'l Mfg. Co., Boston, Mass.

Sheraduct conduit: National Metal Molding Co., 1107 Fulton Bldg., Pittsburgh

Shield wire: Ansonia Elec. Co., Ansonia, Conn.

Shiffler towers: Am. Bridge Co., N. Y.

Show-pen fixture fitting: Crescent Brass Mfg. Co., Cleveland, O.

Shurlock lamp lock: Pass & Seymour, Solvay, N. Y.

Siemen's carbon: L. E. Frorup & Co., New York, N. Y.

Siemen's lamp: H. M. Hirschberg Co., New York, N. Y.

Siemens-Halske inst.: James G. Biddle, 1211 Arch, Philadelphia, Pa.

Siemens, T. B., carbon: Charles L. Kiewert Co., New York, N. Y.

Signaloid inc. lamp coloring: Universal Elec. Stage Ltg. Co., New York.

Silent motor: Wagner Elec. Mfg. Co., St. Louis, Mo.

Silent pumps: Centrifugal Pump Co., N.Y.

Silent Valve ltg. outfits: E. L. Russell Co., Indianapolis, Ind.

Silex filling & sealing compounds: Bridgeport Wood Finishing Co., New Milford, Conn.

Silkenamel wire: Belden Mfg. Co., 2308 Western ave., S. Chicago, Ill.

Silkenite magnet wire: Acme Wire Co., New Haven, Conn.

Silvertip carbon: National Carbon Co., Cleveland, O.

Simcore wire: Simplex Wire & Cable Co., Boston, Mass.

Simmen st. ry. signal: Northey Simmen Signal Co., Indianapolis, Ind.

Sim-Peel-O peeler: Davis, Crouse Mfg. Co., Chicago, Ill.

Simple portable tool: Wiley Mach. Co., Jeffersonville, Ind.

Simplex connector: Geo. W. Bolton, Detroit, Mich.

Simplex cow milker: D. M. Burrell & Co., Little Falls, N. Y.

Simplex fan deflector: James Goldmark, New York, N. Y.

Simplex fire ext.: David Kahnweiler's Sons, New York, N. Y.

Simplex iron mach.: Am. Ironing Mach. Co., Chicago, Ill.

Simplex lantern: Stelling Mfg. Co., Port Washington, Wis.

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Simplex tree insulator: Geo. Cutter Co., 411 Notre Dame st., So. Bend, Ind.

Simplex vacuum cleaner: Ramey Co., Chillicothe, O.

Simplicity rectifiers: Wilson Supply Co., Cleveland, O.

Simplicity rheostat: Cutler-Hammer Mfg. Co., Milwaukee, Wis.

Simplicity vac. cleaners: Wise-Harrold Elec. Co., New Philadelphia, O.

Six-in-One safety fuse plug: C. C. Balassa, New York.

Skeedoodle Flasher: Phelps Mfg. Co., Detroit, Mich.

Skeleton nitrogen units: Electric Operations Co., Bush Terminal, Brooklyn, N. Y.

Sky-Rocket arrester: Chance Mfg. Co., Centralia, Mo.

Silkup lacquer: N. B. Arnold, Brooklyn

Slipon adjuster: H. A. Bates, Garwood, N. J.

Sloan sleet cutter: W. R. Garton Co., 15 S. Desplaines st., Chicago, Ill.

Smith ticket puncher: Automatic Appliance Co., Boston, Mass.

Smith trolley wheel: Worcester Ry. Supply Co., Worcester, Mass.

Smith bell: Searles Elec. Co., Chicago.

Snap On shade holder: Peerless Light Co., Peerless Bldg., Chicago, Ill.

Snowflake shade: John Morgan & Sons, New York, N. Y.

Snow pumps: Int'n'l Steam Pump Co., New York.

Snowflake comp. soldering: Crassell Chem. Co., Cleveland, O.

Snyder furnace: Metallurgic Engineering Co., Chicago, Ill.

So Easy flat iron: Phelps Mfg. Co., Detroit, Mich.

Solar auto lamp and numbers: Badger Brass Co., Kenosha, Wis.

Solar therapeutic arc lamp: Sanitarium Equipt. Co., Battle Creek, Mich.

Solderine sold. comp.: Central Stamping Co., New York, N. Y.

Soldux self-fluxing solder: Dielectric Mfg. Co., St. Louis, Mo.

Sollux st. fixture: Geo. Cutter Co., So. Bend, Ind.

Sonoscope sound locating: American Elec. Co., Chicago, Ill.

Sootless spark plug: Oakes & Dow Co., Boston, Mass.

S. O. S. storage bat.: Victor Storage Battery Co., Rock Island, Ill.

Sparton horn: Sparks-Withington Co., Jackson, Mich.

Speed battery: Elec. Storage Supply Co., Boston, Mass.

Spermo commutator: Warren Lubricant Co., Buffalo, N. Y.

Spit Fire spark plug: A. R. Mosler & Co., Mt. Vernon, N. Y.

Square D meter terminal boxes: Detroit Fuse & Mfg. Co., 1411 Rivard st., Detroit, Mich.

Square End pipe cutters: Borden Co., Warren, O.

Squires storage bat.: J. F. Ashbrook, Chicago, Ill.

Stahley box: Thomas & Betts Co., 103 Hudson st., New York.

Sta-Hot sad irons: Electric Specialties Co., Lansing, Mich.

Standard A. guard: McGill Mfg. Co., 39 Oak st., Valparaiso, Ind.

Standard battery: J. H. Bunnell & Co., 32 Park pl., New York, N. Y.

Standard boring tool: Busch Mfg. Co., San Francisco, Cal.

Standard condenser: Thompson-Levering Co., Philadelphia, Pa.

Standard conduit bender: Thomas & Betts Co., 103 Hudson st., New York.

Standard exp. bolt: Mathias Klein & Sons, Chicago.

Standard fan: Robbins & Myers Co., Springfield, O.

Standard ins. tape: Canfield Rubber Co., Bridgeport, Conn.

Standard paring machine: Reinhold Mfg. Co., Detroit, Mich.

Standard pyrometer: Beighlee Elec. Co., Cleveland, O.

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Standard soldering comp.: Brassell Chem. Co., Cleveland, O.

Standard st. ry. signal: General Ry. Signal Co., Rochester, N. Y.

Stand-By battery: National Carbon Co., Cleveland, O.

Stand-By storage battery: Elec. Storage Battery Co., Philadelphia, Pa.

Stand-O-Lite desk light: R. M. Millar Elec. Wks., Chicago.

Stanwove tape: Standard Woven Fabric Co., Framingham, Mass.

Sta-Rite auto switch: Frank W. Morse, Boston, Mass.

Sta-Rite spark plug: Sturdy Mfg. Co., Chicago, Ill.

Star conduit fittings: Steel City Elec. Co., 1207 Columbus ave., Pittsburgh, Pa.

Star cut-out: Barkelew Elec. Mfg. Co., Middletown, O.

Star cloth cutter: Wolf Elec'l Promoting Co., Cincinnati, O.

Star clothes washer: American Washer Co., St. Louis, Mo.

Star commutator: McGill Mfg. Co., 39 Oak st., Valparaiso, Ind.

Star-Delta motor starting switch: Carman & Fryer, Indianapolis, Ind.

Star gong: Samson Elec. Co., Canton, Mass.

Star hat cleaner: Paul Basso, Wilkes-Barre, Pa.

Star headlight: Trolley Supply Co., Canton, O.

Star sold. comp.: McGill Mfg. Co., 39 Oak st., Valparaiso, Ind.

Sta-There connector: Manhattan Elec'l Supply Co., 17 Park pl., New York.

Staysalite torch: Mathias Klein & Sons, Chicago, Ill.

Stayslit flashlight: Lincoln Elec. Htg. Appliances, Inc., 112 W. Adams st., Chicago, Ill.

Steel Gain cross arm: Hallett Iron Wks., Harvey, Ill.

Step-O-Lite battery lantern: Bass-Moody Co., Peoria, Ill.

Trade Names

Steelite armored extension wire: Inland Elec. Co., Chicago. Ill.
Stephens pole climber: W. H. Buckingham, Binghamton, N. Y.
Sterling conduit & cable: Safety Armorite Conduit Co., Bailey Farrell Bldg., Pittsburgh, Pa.
Sterling tape: Boston Woven Hose & Rubber Co., Dept. No. 50 Cambridge, Mass.
Sterling trolley base: Lord Mfg. Co., Brooklyn, N. Y.
Sterling water heater: Sales Co., Inc., San Francisco, Cal.
Sterling wire: Standard Underground Cable Co., Pittsburgh, Pa.
Stern-Condensite, Insulation: Dickinson Mfg. Co., Springfield, Mass.
Sternoid insulation: Dickinson Mfg. Co., Springfield, Mass.
Stewart horse clipper: Chicago-Flexible Shaft Co., Chicago, Ill.
Stickalite trouble lamp: Premier Elec. Co., Chicago, Ill.
Stick-lac compound: Emil Calman & Co., New York, N. Y.
Stik-O-Lite flashlight: Import Sales Co., 19 East 21st st., New York, N. Y.
St. Louis pick-ups: Elec. Service Supplies Co., Philadelphia, Pa.
Stone-Duct conduit: Chicago Stone Conduit Co., Chicago, Ill.
Straight Line bell: P. R. Mfg. Co., 621 Bellevue ave., Detroit, Mich.
Sturgess water wheel: Ludlow Valve Mfg. Co., Troy, N. Y.
Sturtevant vac. cleaner: Western Elec. Co., New York, N. Y.
Sudan shade: Holophane Wks. of G. E. Co., Cleveland, O.
Su-Dig spark plug: Superior Motor Specialty Co., Philadelphia, Pa.
Sun battery: Stackpole Carbon Co., St. Marys, Pa.
Sunlight desk light: Stanley & Patterson, 23 Murray st., New York.
Sunlite reflector: Duhrssen & Pfaltz, New York.
Sun Ray htg. pad: P. & B. Mfg. Co., Milwaukee, Wis.
Sun-Star turndown lamp: F. J. Rooney Lamp Co., Hoboken, N. J.
Superb vac. clean.: Cyclone Vacuum Cleaner Co., Bradford, Pa.
Superior fish wire: Steel City Elec. Co., 1207 Columbus ave., Pittsburgh, Pa.
Superior resistance wire: H. Boker & Co.. New York, N. Y.
Superior rigid conduit: Central Tube Co., Pittsburgh, Pa.
Superior water heater: National Stamping & Elec. Wks., Chicago, Ill.
Superlux glassware: Lighting Studios Co., New York, N. Y.
Sure Grip linemen's climber: Cronk & Carrier Mfg. Co., Elmira, N. Y.
Sure Grip pulley: Ft. Wayne Elec. Wks. of G. E. Co., 1612 Broadway, Ft. Wayne, Ind.
Sure Grip trolley clamp: Electric Railway Equipment Co., Cincinnati, O.
Surlock locking socket: Pass & Seymour, Solvay, N. Y.
Sure-wink flasher: Phelps Mfg. Co., Detroit, Mich.
Su-Ton spark plug: Superior Motor Specialty Co., Philadelphia, Pa.
Swing motor: B. A. Wesche Elec. Co., Cincinnati, O.
Swisher cable hanger: National Tele. Supply Co., Cleveland, O.
S. X. battery: Maxivolt Primary Battery Co., New York, N. Y.
S. & C. high potential fuse: Chemelectric Co., Chicago, Ill.
S. & P. alarm: Stanley & Patterson, New York, N. Y.
S. & S. plier: Schuchardt & Schutte, New York, N. Y.
Taplets conduit fitting: H. T. Paiste Co., Philadelphia, Pa.
Tap-On connector: Jordan Bros., 74 Beekman, New York, N. Y.
Tara glass shade: Tarentum Glass Co., Tarentum, Pa.
Targon vapor lamp: Cooper Hewitt Elec. Co. Hoboken, N. J.
Taussig show case fix. Reflector & Hdw. Specialty Mfg. Co., Chicago, Ill.
Taylor's tail light: Premier Elec. Co., Chicago, Ill.
T-B Gem outlet box: Duncan Elec. Co., Alton, N. H.
T. C. R. lamp post: Central Elec. Co., Chicago, Ill.
Teco charging outfits, conduit fitting and boxes: Troy Elec'l Co., Troy, N. Y.
Tegit insulation: Hemming Mfg. Co., Garfield, N. J.
Telautograph: Gray National Telautograph Co., New York, N. Y.
Tele-Call signal: Mead Elec. Signal Co., Cleveland, O.
Telefault fault finder: Mathews & Bro., W. N., 3705 Forest Park blvd., St. Louis, Mo.
Telefunken wireless inst.: Atlantic Communication Co., New York.
Telegraphone tele.: Nat'l Telegraphone Co., El Paso, Tex.
Teleheight pole measure: Mathews & Bro., W. N., 3705 Forest Park blvd., St. Louis, Mo.
Telepipe pipe locator: Mathews & Bro., W. N., 3705 Forest Park blvd., St. Louis, Mo.
Telodective: Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y.
Telometer toll box: Turner Brass Wks., Sycamore, Ill.
Temco l. v. transformer: Electric Mfg. Co., Baltimore, Md.
Tesla coil: Wappler Elec. Mfg. Co., New York.
The Allen soldering comp.: L. B. Allen Co., Chicago.
Therlo resistance wire: Driver-Harris Wire Co., Harrison, N. J.
Thermax sad iron: Landers, Frary & Clark, New Britain, Conn.
Thermo-Blink flasher: Kelley & Kelley, Jersey City, N. J.
Thermoplax insulation: Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Therol heating device: Elec. Heat Storage Co., New York.
Thesco clamp: States Co., Park st., cor. New Park ave., Hartford, Conn.
Thomas hair waver: Thomas Grosert, New York, N. Y.
Thomas meter: Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Thompson-Ryan motor: Ridgway Dynamo & Engine Co., Ridgway, Pa.
Thompson wattmeter: General Elec. Co., Schenectady, N. Y.
Thor specialties: Hurley Machine Co., 37 S. Clinton st., Chicago, Ill.
Thor drills: Independent Pneumatic Tool Co., Chicago, Ill.
Three Heat sad iron: Current Elec. Co., Chicago, Ill.
Tic-Tac flasher: Kelley & Kelley, Jersey City, N. J.
Tidman st. fixture: National Metal Stamping & Mfg. Co., Newark.
Tiger tape: Boston Woven Hose & Rubber Co., Dept. No. 50, Cambridge, Mass.
Timbersphalt preservative: Indiana Refining Co., Cincinnati, O.
Time-O-Nite flashlight: Electrocraft Co., Philadelphia, Pa.
Tinol torch and solder: Hess & Son, Philadelphia, Pa.
Tip Top push button: Benjamin Elec. Mfg. Co., 120 S. Sangamon st., Chicago, Ill.
Tip Top wire: Standard Underground Cable Co., Pittsburgh, Pa.
Titan lamp: Greenwich Sales Co., 357 Broadway, New York, N. Y. (Imp.).
Toastove toaster: Hoskins Mfg. Co., Detroit, Mich.
Toledo clothes washer: American Woodenware Co., St. Louis, Mo.
Tophet res. wire: Murray Wire Co., Newark, N. J.
Topnotch battery: U. S. Auto Battery Co., New York.
Torrid torch: G. W. Diener Mfg. Co., Chicago, Ill.
Tranalux reflectors: Pittsburgh Lamp, Brass & Glass Co., Pittsburgh, Pa.
Tremont st. fixture: National Metal Stamping & Mfg. Co., Newark, N. J.
Triangle arrester: J. H. Bunnell & Co., 32 Park pl., New York, N. Y.
Triangle htg. devices: American Elec. Heater Co., Detroit.
Tricoat wire: General Electric Co., Schenectady, N. Y.
Trident clamp: Newhall Chain Forge & Iron Co., New York, N. Y.
Trinity bell: Trinity Bell Elec. Mfg. Co., Chicago, Ill.
Trio canopy insulator: J. H. Parker, Chelsea, Mass.
Trio stocks and dies: Wells Bros. Co. Division Greenfield Tap & Die Corporation, Greenfield, Mass.
Tripartite pole and trans. towers: Franklin Steel Co., Franklin, Pa.
Triple Heat flat iron: Waage Elec. Co., Chicago, Ill.
Triple Petticoat insulator: Locke Ins. Mfg. Co., Victor, N. Y.
Triplex specialties: Blow Steel Const. Co., Pittsburgh, Pa.
Triton wire: Atlantic Ins. Wire & Cable Co., 120 Liberty st., New York.
Triumph spark plug: A. R. Mosler & Co., Mt. Vernon, N. Y.
Trojan battery: National Carbon Co., Cleveland, O.
Trojan fan: Emerson Elec. Co., 2032 Washington ave., St. Louis.
Trojan trolley pole catcher: Ham Sand Box Co., Troy, N. Y.
Trotter's commutator polish: James Goldmark, New York, N. Y.
Trutint shade: Holophane Wks. of G. E. Co., Cleveland, O.
Trynauer's med. app.: Kny-Scheerer Co., New York, N. Y.
T-split connector: Elec'l Eng. Equipt. Co., Chicago, Ill.
Tucap knobs: Cook Pottery Co., Dept. J, Trenton, N. J.
Tudor storage battery: Elec. Storage Battery Co. Philadelphia, Pa.
Tuec switchboard cleaner: United Elec. Co., Canton, O.
Tuerk ceiling fan and water motor: Hunter Fan & Motor Co., 114 Liberty st., New York.
Tungsten brush: Pure Carbon Co., Wellsville, N. Y.
Turn-Lo regulating socket: Electrical Auxiliaries Co., Chicago, Ill.
Turner torch: Mathias Klein & Sons, Chicago, Ill.
Tute horn: Garford Mrf. Co., Elyria, O.
Tuxedo st. fix.: National Metal Stamping & Mfg. Co., Newark, N. J.
T. V. switches: Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.

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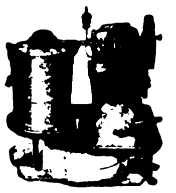

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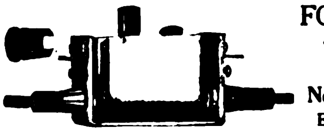

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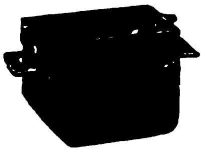
Trade Names

Twentieth Century elevator: J. W. Reedy Elevator Mfg. Co., Chicago.
20th Century ultra violet ray lamp: Midgeley's Radiodescent Lamp Co., Kalamazoo, Mich.
Two Ball adjuster: Gund Mfg. Co., 320 Jay st., La Crosse, Wis.
Two In One shade holder: Waldo Co.,N.Y.
Typhoon turbine blower: L. J. Wing Mfg. Co., New York, N. Y.
Tyrolean bell: Samson Elec. Co., Canton, Mass.
Tytanic auto wiring and ltg.: Garford Mfg. Co., Elyria, O.
T. Z. R. wire: Simplex Wire & Cable Co., Boston, Mass.
T. & B. conduit fitting: Thomas & Betts Co., 103 Hudson st., New York.
Uemco rheostat: Union Elec. Mfg. Co., Milwaukee, Wis.
Underwriters racks & rings: Chas. Nuhring & Bros., Cincinnati, O.
Unilets conduit fittings and boxes: Appleton Elec. Co., 212 N. Jefferson st., Chicago, Ill.
Union arrester: J. H. Bunnell & Co., 32 Park pl., New York, N. Y.
Union arrester: Manhattan Elec'l Supply Co., 17 Park pl., New York.
Union box cut-outs and fuses: Chicago Fuse Mfg. Co., Chicago, Ill.
Union Standard trolley wheel: Nutall Co., Pittsburgh, Pa.
Unit storage battery: U. S. Light & Htg. Co., New York, N. Y.
U. S. blasting apparatus: du Pont de Nemours Powder Co., Wilmington, Del.
U. S. Naval Reserve battery: National Carbon Co., Cleveland, O.
U. S. rail bond: Am. Steel & Wire Co., Chicago, Ill.
U. S. sleet cutter: Nuttall Co., Pittsburgh, Pa.
Universal armature winding mach.: P. C. Chapman, St. Louis, Mo.
Universal bell: Schwarze Elec. Co., Adrian, Mich.
Universal box: Thomas & Betts Co., 103 Hudson st., New York, N. Y.
Universal cable hanger: National Telephone Supply Co., Cleveland, O.
Universal conduit fitting and bushing: New Process Spec. Co., Enterprise Bldg., Milwaukee, Wis.
Universal cooking utensils: Landers, Frary & Clark, New Britain, Conn.
Universal insulator support: Steel City Elec. Co., 1207 Columbus ave., Pittsburgh, Pa.
Universal desk light: Federal Sign System (Elec.), Lake & Desplaines sts., Chicago, Ill.
Universal desk light: W. S. Hawker Mfg. Co., Dayton, O.
Universal flasher: Elec. Flasher Co., New York, N. Y.
Universal hair drier: Fidelity Elec. Co., Lancaster, Pa.
Universal hat cleaner: Fidelity Elec. Co., Lancaster, Pa.
Universal motor fan: Diehl Mfg. Co., Elizabeth, N. J.
Universal pneumatic duster: P. Pfeffer, Newark, N. J.
Universal rheostat: Simplex Elec. Htg. Co., Cambridgeport, Mass.
Universal sad iron: Landers, Frary & Clark, New Britain, Conn.
Universal socket and receptacle: Weber Elec. Co. (Henry D. Sears, General Sales Agent), Boston, Mass.
Universal switchboard and service box: Geo. Cutter Co., 411 Notre Dame st., So. Bend, Ind.
Universal test clamp: R. S. Mueller & Co., Cleveland, O.
Universal time switch: Elec. Flasher Co., New York, N. Y.
Universal torch: Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Universal trolley hanger: Electric Railway Equipment Co., Cincinnati, O.
Uno shade holder: Bryant Elec. Co., Bridgeport, Conn.
Uptodate screwdriver: John D. Gould, New York, N. Y.
Usaco tape: U. S. Asbestos Co., Manheim, Pa.
U-See-Us drink mixer: Hamilton Beach Mfg. Co., Racine, Wis.
Usem connectors: U. S. E. M. Co., 219 W. 33rd st., New York.
Usemco motor: U. S. Elec'l Mfg. Co., Los Angeles, Cal.
Utilaphone tele. and swboards.: Samson Elec. Co., Canton, Mass.
Utility bell: Manhattan Elec'l Supply Co., 17 Park pl., New York.
Utility chain: F. W. Wakefield Brass Co., Vermilion, O.
Utility floor cleaner: Vacuna Sales Co., New York.
Utility htg. devices: R. M. Millar Elec. Wks., Chicago, Ill.
Utility tape: Mechanical Rubber Co., Cleveland, O.
Vac-M arrester: National Elec. Specialty Co., Toledo, O.
Vacu flasher: Betts & Betts Corporation, 258 West 55th st., New York, N. Y.
Vaculite compound: John C. Dolph Co., Newark, N. J.
Vademecum flashlight: L. B. Lincoln Elec. Wks., 112 W. Adams st., Chicago.
Vak-Klean vac. clean.: Hanlon & Wilson, Wilkinsburg, Pa.
Valtory magnet wire: Standard Underground Cable Co., Pittsburgh, Pa.
Vanitie portable lamp: Aladdin Lamp Corp., 52 Vanderbilt ave., New York, N. Y.
Vapoform vaporizer: Bennett & Brown, Paterson, N. J.
Vaporel disinfector: Greenwich Sales Co., 257 Broadway, New York, N. Y.
Varley coil: Auto Coil Co., Jersey City.
Veluria shade: Holophane Wks. of G. E. Co., Cleveland, O.
Ventilite shade holder: Herwig Art Shade & Lamp Co., 2140 N. Halsted st., Chicago, Ill.
Venus flat irons: Phelps Mfg. Co., Detroit, Mich.
Venus headlight: Dayton Mfg. Co., Dayton, O.



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Veribest fuse: Reliable Elec. Co., Chicago, Ill.
Verifax tape: M. W. Dunton Co., Providence, R. I.
Vermont climber: St. Johnsbury Tool Wks., St. Johnsbury, Vt.
Vesco auto specialties: Varney Elec'l Supply Co., Indianapolis, Ind.
Vesey ins. tape: Mica Insulator Co., 68 Church st., New York, N. Y.
Vertoscope pole meas. inst.: United Elec. Co., Marion, O.
Vesta shade: Elkins Glass Co., Monaca, Pa.
Vesuvius spark plug: A. R. Mosler & Co., Mt. Vernon, N. Y.
Vibrasimplex vibrator: Universal Novelty Co., New York, N. Y.
Victolac paint and comp.: Brach Supply Co., Newark, N. J.
Victor alcohol torch: Roberts Elec. Supply Co., H. C., 905 Arch st., Philadelphia, Pa.
Victor battery: Waterbury Battery Co., Waterbury, Conn.
Victor blasting app.: Dupont-De Nemours Powder Co., Wilmington, Del.
Victor bracket: De Veau Tele. Mfg. Co., 478 18th st., Brooklyn, N. Y.
Victor conduit bender and burner: Roberts Elec. Supply Co., 903 Arch st., Philadelphia, Pa.
Victor fan: Western Elec. Co., New York, N. Y.
Victor inst.: H. W. Johns-Manville Co., New York, N. Y.
Victor insulator: Locke Insulator Mfg. Co., Victor, N. Y.
Victor plier: C. E. Bohner Mfg. Co., Campaign, Ill.
Victor shade holder: Plume & Atwood Mfg. Co., Waterbury, Conn.
Victor storage bat.: Milwaukee Auto Specialty Co., Milwaukee, Wis.
Victoria vegetable peeler: Imperial Mach. Co., New York, N. Y.
Vigilant bell: Edwards & Co., New York.
Viking spark plug: John MacGregor Co., Boston, Mass.
Vim magneto: Tritt Elec. Co., Union City, Ind.
Viscus tape: Clifton Mfg. Co., Jamaica Plain, Boston, Mass.
Visor shade: Nat'l X-Ray Reflector Co., 233 Jackson blvd., Chicago, Ill.
Vital spark plug: Bigsby Mfg. Co., Cleveland, O.
Vitr-O-Lite shells: Art Metal Mfg. Co., Cleveland, O.
V. M. C. loop and ring: Virden Mfg. Co., 6011 Longfellow ave., Cleveland, O.
Vogel's fan: Natural Power Co., St. Louis, Mo.
Vogel ground clamp: Fairmount Elec. & Mfg. Co., Philadelphia, Pa.
Vollans welding machine: Detroit Elec. Welding Co., Detroit, Mich.
Volto magneto: Witherbee Igniter Co., Springfield, Mass.
Voltak chemical bat.: Powers-Weightman-Rosengarten Co., Phila., Pa.
Vortex dish washer: Hamilton-Low Co., New York.
Vreeland sine-wave oscillator: Western Electric Co., New York, N. Y.
Vulcan alarm: J. H. Bunnell & Co., 32 Park pl., New York, N. Y.
Vulcan gear shifter: Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Vultalac paint and varnish: Standard Varnish Wks., New York, N. Y.
Wagenhals headlight: Dayton Mfg. Co., Dayton, O.
Wagner reversible fixture switch: Sterling Bronze Co., New York, N. Y.
Wagor guard: McGill Mfg. Co., 39 Oak st., Valparaiso, Ind.
Wallworks portables: Well Light Co., Jersey City, N. J.
Walser sign: A. & W. Elec. Sign Co., Cleveland, O.
Walters torch: Quadriga Mfg. Co., Chicago, Ill.
Walton clothes washer: Home Washing Machine Co., Brooklyn, N. Y.
Walton pulley block: Mathias Klein & Sons, Chicago.
Wamanco clothes washer: American Washer Co., St. Louis, Mo.
Wands vacuum cleaner: Standard Mfg. Co., Syracuse, N. Y.
Wantz coil: Victor Elec. Co., Chicago.
Ward desk light: McLeod, Ward & Co., New York, N. Y.
Waring cloth cutter: Am. Elec. Mach. Co., New York, N. Y.
Warner battery gauge: Standard Elec. Time Co., Springfield, Mass.
Watertite coil box: Stanley & Patterson, 23 Murray st., New York, N. Y.
Watight waterproof receptacle: Elec. Appliance Co., Chicago.
Watson specialties: Mechanical Appliance Co., Milwaukee, Wis.
Way bracket: St. Louis Malleable Casting Co., 7777 N. Conduit ave., St. Louis.
Wayne transformer: Ft. Wayne Elec. Wks. of G. E. Co., 1612 Broadway, Ft. Wayne, Ind.
Webster lamp adjuster: Frank W. Morse, Boston, Mass.
Weldwell sold. comp.: Westinghouse Elec. & Mfg. Co., E. Pitsburgh.
Wellman headlight: Dayton Mfg. Co., Dayton, O.
Western dry battery: Standard Carbon Co., Los Angeles, Cal.
Westfield comealong: Eureka Co., North East, Pa.
White rigid conduit: Central Tube Co., Pittsburgh, Pa.
White-Cross specialties Lindstrom-Smith Co., 1100 S. Wabash ave., Chicago, Ill.
White Mason tape: St. Louis Rubber Cement Co., St. Louis, Mo.
White switchboard: Eynon-Evans Mfg. Co., Philadelphia, Pa.
Whitelite lamp: New York Engravers Supply, New York, N. Y.
Whittingham rheostat: Automatic Switch Co., New York, N. Y.
Wico cap light: Witherbee Igniter Co., Springfield, Mass.
Wi-co Hangstrait hickey: Wilton Mfg. Co., Wrightsville, Pa.
Willey motors and portable tools: James Clark, Jr., Elec. Co., Louisville, Ky.
Wilson torch: Turner Brass Wks., Sycamore, Ill.
Winfield photo lamp: Williams-Lloyd Mchy. Co., Chicago, Ill.
Winner tape: E. W. Manter & Co., 158 Purchase st., Boston, Mass.
Wire Grip moulding: Mitchell Moulding Co., Chicago, Ill.
Wireduct conduit: Am. Conduit Mfg. Co., Keystone Bldg., Pittsburgh, Pa.
Wire-Lock poles: Electric Railway Equipment Co., Cincinnati, O.
Wishbone Cross Arms: R. Thomas & Sons Co., East Liverpool, O.
Witham batteries & specialties: E. Marcuson, New York, N. Y.
Withers Lineman's Protector: Associated Engineer's Co., Chicago, Ill.
Wizard battery: Stackpole Carbon Co., St. Marys, Pa.
Wizard bell: Ansonia Elec'l Co., Ansonia, Conn.
Wizard cigar lighter: Eldred Mfg. Co., Chicago, Ill.
Wizard spark plug: Hampshire Mfg. Co., Hatfield, Mass.
Wizard tape: Boston Woven Hose & Rubber Co., Dept. No. 50, Cambridge, Mass.
W. M. C. voltage regulator: Portland Co., Portland, Me.
Wold pneumatic brush: Liquid Carbonic Co., Chicago, Ill.
Wonder clothes washer: Victor Mfg. Co., Leavenworth, Kans.
Wonderlite flashlight: Frederick Ball, New York.
Wonderliter: Art Metal Wks., Newark, N. J.
Wood specialties: Ft. Wayne Elec. Wks. of G. E. Co., 1612 Broadway, Ft. Wayne, Ind.
Workrite push button: S. B. Couch Co., Norfolk Downs, Mass.
World lamp: F. J. Rooney Lamp Co., Hoboken, N. J.
Worthington pump: International Steam Pump Co., New York, N. Y.
Wotton charging outfit: Elec. Products Co., Cleveland, O.
W. P. paint: Standard Varnish Wks., 100 William st., New York, N. Y.
Wright cable hanger: Rhode Island Tel. & Elec. Co., Providence, R. I.
Wright spark plug: N. Y. Mica & Mfg. Co., Auburn, N. Y.
Wurts arrester: Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
W. & M. wire: Am. Steel & Wire Co., Chicago, Ill.
Xduct conduit: Am. Circular Loom Co., New York, N. Y.
X. L. trouble chaser: R. M. Millar Elec. Wks., Chicago, Ill.
X-Ray battery: Stackpole Carbon Co., St. Marys, Pa.
X-Ray coil: Pfantiehl Elec'l Laboratory, Chicago, Ill.
X-Ray shade: Nat'l X-Ray Reflector Co., 233 W. Jackson blvd., Chicago, Ill.
Xtraficiency shade: Holophane Wks. of G. E. Co., Cleveland, O.
X. X. X. bell: P. R. Mfg. Co., 631 Bellevue ave., Detroit, Mich.
Yager's stick and salts: Alex. R. Benson Co., Hudson, N. Y.
Yankee boring tool, Yankee screwdriver: North Bros. Mfg. Co., Phila., Pa.
Yankee soldering comp.: Chas. W. Leveridge, New York, N. Y.
Yates dry battery: Wm. Roche Elec'l Co., New York.
Yerkes bells and chimes: Betts & Betts Corp., 258 West 55th st., New York, N. Y.
Young canopy insulator: Mica Insulator Co., 68 Church st., New York.
Young signal: Gen'l Ry. Signal Co., Rochester, N. Y.
Youngstown safety limit switch: Eastern Elec. Co., Cleveland, O.
Zebel tele.: Am. Elec. Co., Chicago, Ill.
Zeek boring tool: Jas. McCrea & Co., Chicago, Ill.
Zeidler baby torch: McGill Mfg. Co., 39 Oak st., Valparaiso, Ind.
Zenith desk light: J. H. White Mfg. Co., 111 N. 3d st., Brooklyn, N. Y.
Zeno connector: Ft. Dearborn Mfg. Co., Chicago, Ill.
Zinkote conduit: Mark Mfg. Co., Chicago.

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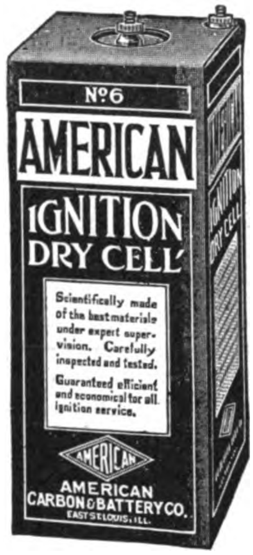
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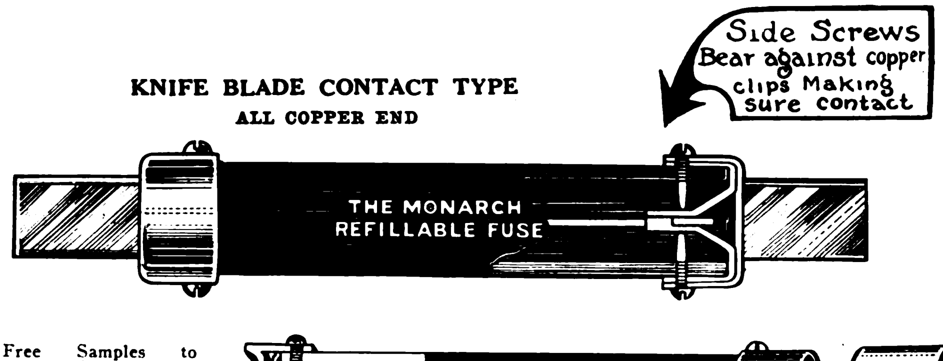
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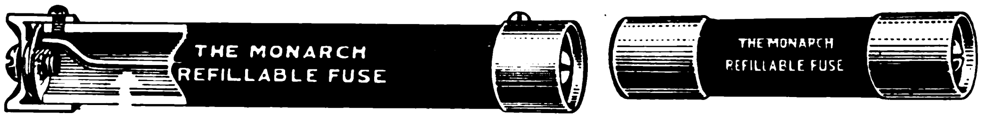

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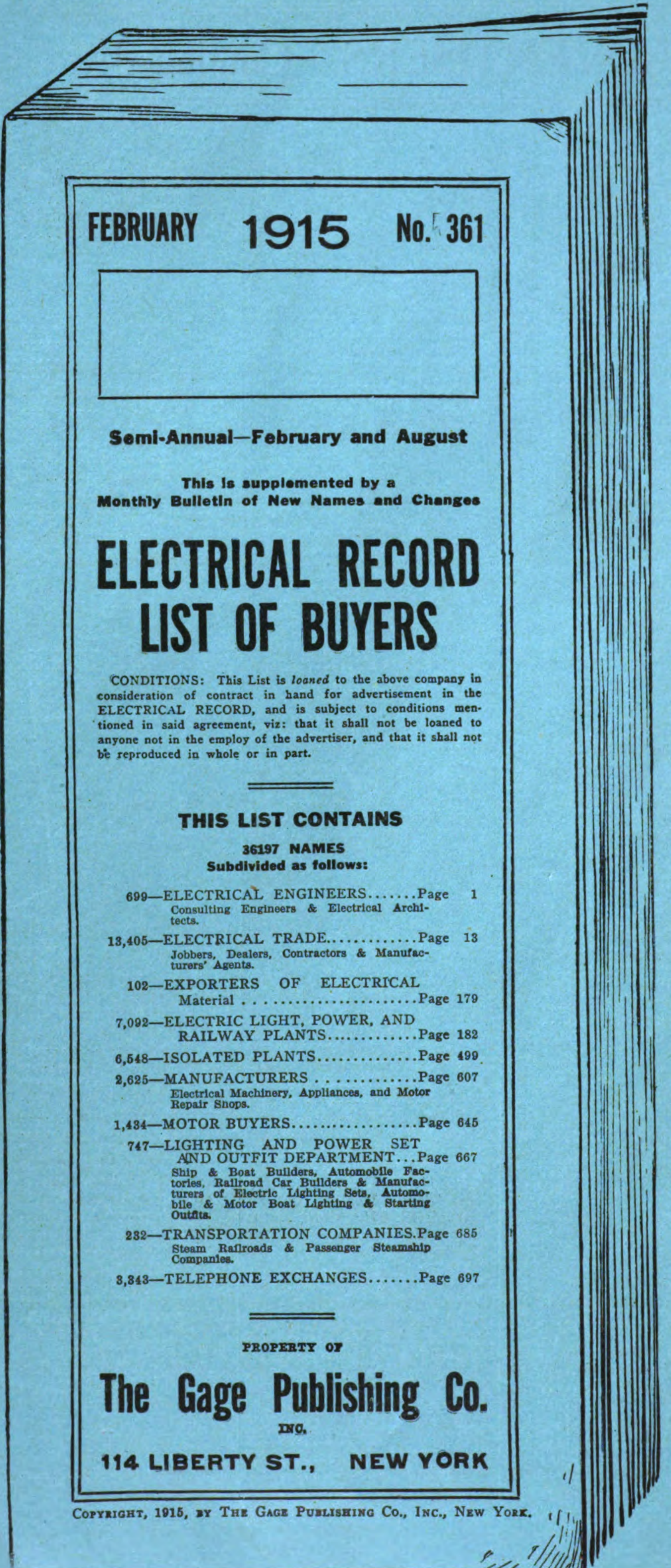

FEBRUARY 1915 No. 361

Semi-Annual—February and August

**This is supplemented by a
Monthly Bulletin of New Names and Changes**

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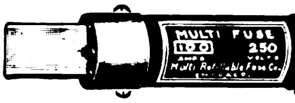

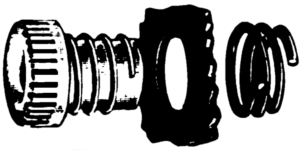

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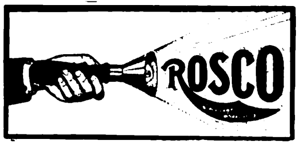

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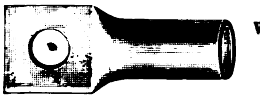

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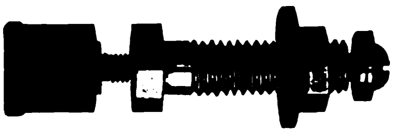

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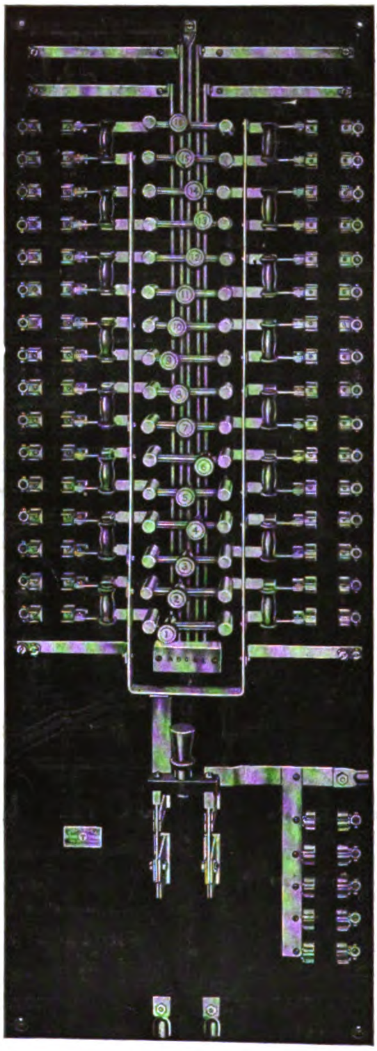

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